Ministry of Environment

2017 State of the Environment Report

Government of Saskatchewan

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Introduction

Saskatchewan people deserve to know the air they breathe is clean. They expect the water they drink is safe. They want to know we're protecting our wildlife and natural habitats for the enjoyment of future generations.

At the same time, Saskatchewan people expect that our rich forests, minerals and natural resources are being developed in a safe and sustainable way. They anticipate a future full of economic growth and well-paying jobs for their children.

These twin expectations are the sum and substance of our ministry's mission. These expectations must exist in tandem and advance together for the betterment of those who come after us. Only then is the Government of Saskatchewan living up to its fundamental mission. That mission: making our province the best place in the world to raise a family, build a home or start a business.

Minister's Message

Thank you for your interest in the 2017 Saskatchewan State of the Environment Report. Every two years, Saskatchewan's *Environmental Management and Protection Act, 2010* calls for the tabling of this report. I believe the report lays out some important information in a clear, objective and comprehensive way. This is timely information about the health of our environment. With this report, our government demonstrates a commitment to transparency that will inform open and honest discussion.

My hope is that interested people will use this report to help make important decisions about the future of Saskatchewan. In addition, I hope this report will raise awareness about how demands for growth can be balanced with the need for sustainability.

In this year's State of the Environment Report, we're trying a few new things. We will still maintain our commitments to objectivity and transparency. However, this year we are moving the report online to saskatchewan.ca/environment. This will allow our ministry to update and share new information as soon as it becomes available. As always, the report will be tabled in the Legislative Assembly, with printed copies made available. However, the charts, graphs and text will be launched online in 2017 and updated regularly.

Also, we will be using new language to explain things in a way that I hope is more accessible and understandable to most readers.

Thank you for your interest in our province, our people and our future.

Scott Moe
Minister of Environment

Highlights

- Air quality in Saskatchewan is generally **good to excellent**.
- **Air pollution levels are quite low**, with the exception of pockets of sour gas emissions and during forest fires.
- Saskatchewan's largest greenhouse gas emitter, SaskPower, is making a strong commitment to **double the use of renewable energy to 50 per cent by 2030**.
- **Levels of sulphur dioxide and nitrogen oxides in the air are falling**, a trend that started in 2010.
- **Fine particulates in our air are increasing**, largely due to extreme forest fire activity across Canada
- Saskatchewan has **developed a forest insect and disease strategic planning** to protect our forests against damage.
- **About 95 per cent of harvested forest areas in our province have been successfully regenerated**.
- The people of our province recycle 86 per cent of the bottles where a deposit was paid. **About 20 million tires have been recycled** since the program began 16 years ago, and more than 19 million litres of used oil were recycled in 2015 alone.
- In 2015, almost **45,000 tonnes of solid waste were diverted from landfills**.
- Saskatchewan is the biggest natural carbon sink in Canada. In 2014, soils in our province absorbed just over **11 million tonnes of carbon from the atmosphere**.
- Saskatchewan's surface water quality monitoring program includes **24 monitoring stations across the province**. Water protection plans have been developed in 11 watersheds.
- The Quill Lakes have developed into one of Canada's most complex water management issues. **Water levels have increased by 6.8 metres (22 feet) since 2004**. Saskatchewan's Water Security Agency is working to develop a modern system of water management, including new policies and regulations.

Method

We've divided Saskatchewan's State of the Environment Report into four sections: air, habitat, land and water. Within these four sections you will find information about Saskatchewan's environment.

Previous reports have used a "condition-stressor-response" model to present this information. This year's report will simplify and clarify that language. In each section, the report will provide the following information.

Why it matters
An explanation of what information the environmental indicator conveys and why that information is important.

What is happening
An explanation of how human activities are having an impact on specific environmental indicators.

What we are doing
Actions that are being taken to improve or maintain environmental conditions.

List of Indicators

Air

- Greenhouse Gas Emissions
- Air Pollutant Volume
- Air Pollutant Concentration

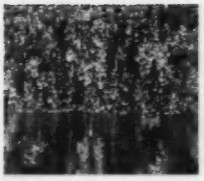
Habitat

- Effective Renewal
- Forest Type and Age
- Wildfire Disturbance
- Insects and Disease
- Proportion of Provincial Annual Cut

Land

- Waste Recycling
- Private Land Stewardship
- Agricultural Land Cover

Water



- Water Quality
- Water Quantity
- Water Allocations
- Consumption and Conservation

air

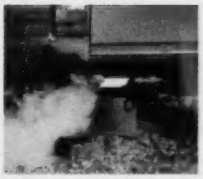
Air quality is critical to the health of Saskatchewan's people and our natural environment. Good air quality complements sound economic growth. Repairing poor air quality is expensive and time consuming.

Air quality across Saskatchewan is generally good to excellent.

Saskatchewan has established a provincial network of 19 continuous air monitoring stations. These stations track emissions from industry, mining, agriculture, forest fires and our vehicles. What those tracking stations show is that air quality across our province is good to excellent. Air pollution levels are normally quite low in Saskatchewan. The major exceptions are during forest fires and pockets of sour gas emissions connected to the energy sector.

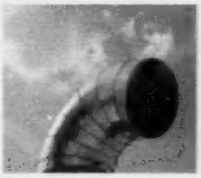
Key Indicators

Greenhouse Gas Emissions



Climate change is a long-term shift in weather patterns. Find out what contributes to climate change, and what Saskatchewan is doing to reduce emissions and clean up energy generation produced from burning coal. *(see page 5)*

Air Pollutant Volume



Air pollutant volume tracks the total amounts of major air pollutants released each year in Saskatchewan. Learn about emissions from each industry sector and how Saskatchewan works with other jurisdictions, non-government organizations and stakeholders, to minimize impacts on air quality. *(see page 8)*

Air Pollutant Concentration

Air pollution trends represent the concentrations in a region and overall improvement or degradation over time. Air quality in Saskatchewan is primarily very good and pollution levels are improving for most pollutants. *(see page 12)*

Greenhouse Gas Emissions

Why it matters

Climate change is real and is a problem we must address. The global concentration of carbon dioxide in the atmosphere has reached 400 parts per million. This is the highest rate in recorded history. As stated in Saskatchewan's White Paper on Climate Change released in October of 2016:

> As we go about the business of feeding people and building an economy, we generate carbon and other gases. Those gases cause the planet to warm and the current rate of warming endangers our future.

Canada's share of global greenhouse gas (GHG) emissions is 1.6 per cent. Saskatchewan emissions represent 10 per cent of that 1.6 per cent. We believe greenhouse gas emissions can be reduced in Saskatchewan with a special emphasis on developing transformational clean technology. This new clean technology can be used in our country and around the world.

While we go about the work of addressing climate change, we must remember Saskatchewan has special obligations. People count on our province to provide secure energy and high-quality food.

Our province is helping Canada achieve national emissions reduction targets. We are already taking action to cut GHG emissions in Saskatchewan. In fact, by 2030, we will be one of the few Canadian provinces achieving actual GHG reductions from current levels.

What is happening

Research indicates that climate change may cause increased temperatures and precipitation over the next several decades in Saskatchewan. That could lengthen the growing season in some parts of Saskatchewan. However, warmer winters may also cause problems with more pests and invasive weeds. Changes in how, when and what we feed livestock may also be required.

Drier growing seasons will also make fish and wildlife conservation more difficult. Biodiversity may also suffer. Over the longer term, forest composition and biodiversity will shift in unpredictable ways. Forests may also start growing more quickly in some parts of Saskatchewan, due to warmer temperatures, longer growing seasons and higher carbon dioxide levels.

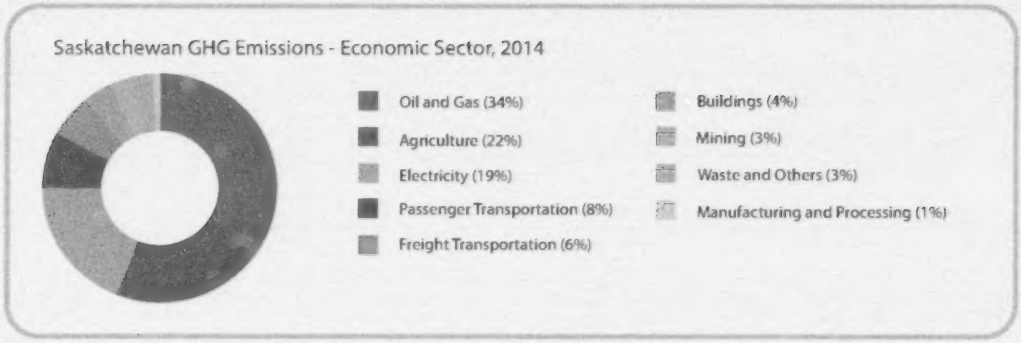
Saskatchewan's Climate Change Numbers

Saskatchewan's GHG emissions in 2014 totalled 75.5 million tonnes. This is small in comparison to the rest of the world. However, the numbers are rising. Our provincial economy is growing. That means oil and gas production, electricity production, agricultural activity and transportation of goods and services are all expanding.

Carbon dioxide represents 66 per cent of Saskatchewan's total 2014 emissions. Other sources include methane (24 per cent), nitrous oxide (10 per cent) and fluoridated gases (less than one per cent).

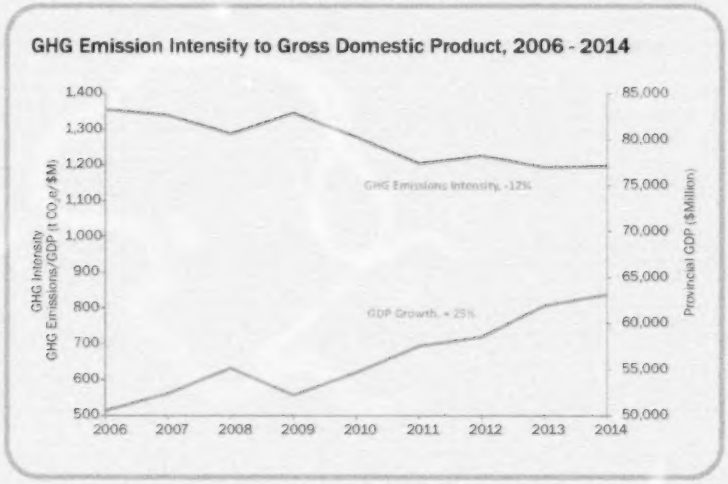
However, Saskatchewan's GHG emissions intensity is dropping. Intensity is the average emissions rate per a given unit of economic production. From 2006 to 2014, GHG emissions intensity in Saskatchewan dropped by 12 per cent, while the province's gross domestic product (GDP) value increased by 25 per cent during the same period. This illustrates the profound impact of energy efficiency improvements and innovation focused on low-carbon technology. We are building and growing more, but polluting less.

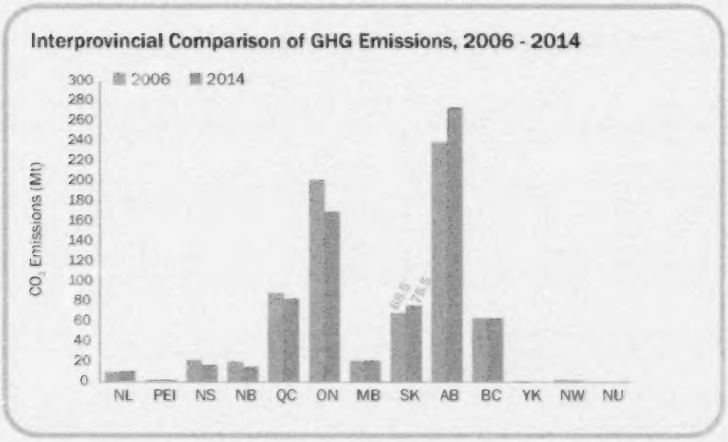
Saskatchewan's GHG emissions totaled 75.5 million tonnes in 2014.



GHG emission intensity decreased by 12 per cent during the 2006-2014 period due to energy efficiency improvements and technological innovation in low-carbon technology.

Saskatchewan is showing leadership in balancing economic growth with environmental outcomes.





What we are doing

Saskatchewan is taking action to reduce its GHG emissions by supporting technology solutions to reduce GHGs from high-emitting sectors.

The province has prioritized cleaning up its use of coal for electricity generation by installing world-leading carbon capture and storage (CCS) technology at SaskPower's Boundary Dam near Estevan. Approximately 800,000 tonnes of carbon dioxide (CO_2) were captured in 2016. CCS technology has the potential to reduce emissions in other countries that continue to open new coal plants. There are currently about 2,400 coal plants in development across the world.

As the province's largest GHG emitter, SaskPower has committed to doubling its renewable energy generation capacity from 25 per cent today to 50 per cent by 2030.

A commitment to an equivalency agreement with the federal government on phasing out coal-fired electricity generation was announced in November 2016. Once finalized, the federal/provincial equivalency agreement will provide Saskatchewan more flexibility in transitioning to additional renewable energy, including evaluating future opportunities for CCS. An equivalency agreement provides flexibility for coal-fired electrical producers to meet compliance obligations, while achieving equal or better environmental outcomes.

As the province's largest GHG emitter, SaskPower has committed to doubling its renewable energy generation capacity from 25 per cent today, to 50 per cent by 2030. This goal will be achieved by a major expansion in wind power, along with other renewables, such as solar, biomass, geothermal and hydro. SaskPower will reduce its GHG emissions to 40 per cent below 2005 levels by 2030.

Investments in new electricity generation systems will also lay the groundwork for deeper emissions reductions beyond 2030. SaskPower and SaskEnergy are pursuing energy efficiency and conservation measures to reduce energy usage by their customers to further reduce provincial GHG emissions.

The land itself is an important carbon sink. Saskatchewan's land base includes extensive natural landscapes such as forests, wetlands and grasslands, and also supports agricultural ecosystems that capture and store carbon.

Saskatchewan is also working in partnership with the Canadian Association of Petroleum Producers (CAPP) and the Ministry of the Economy to reduce GHG emissions from flaring and venting activities. The Ministry of Environment is encouraging the development of GHG inventories in partnership with the Saskatchewan Urban Municipalities Association (SUMA), and the cities of Saskatoon and Regina, under the Federation of Canadian Municipalities' Partners for Climate Protection Program. Best practices for reducing GHGs from landfills, transportation systems, and other municipal operations are being implemented under this program.

Air Pollutant Volume

Why it matters

In order to evaluate air quality in Saskatchewan, it's important to know the total volume of air pollution produced. That volume is influenced by the particular characteristics of individual emissions and factors such as the weather, wind and temperature. In this section, we examine the total amounts of three primary air pollutants – fine particulates, sulphur dioxide and nitrogen oxides.

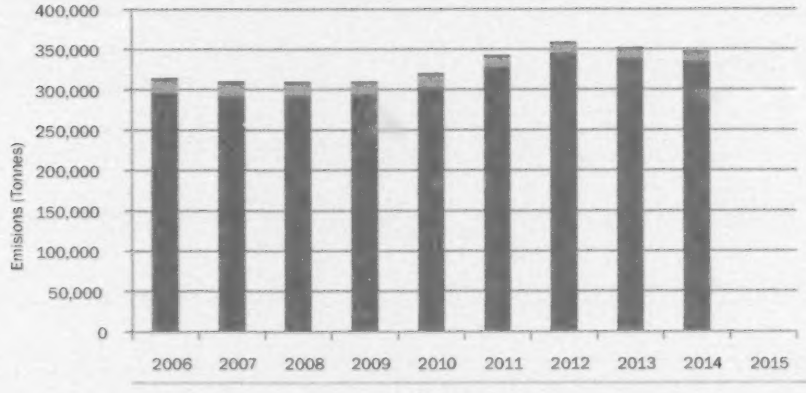
What is happening

All sectors of the Saskatchewan economy produce emissions. Oil, gas and mining, electrical generation, the transportation sector as well as agriculture, forest fires and road dust all play a role.

Generally speaking, levels of sulphur dioxide (SO_2) and nitrogen oxides (NO_x) have been dropping in Saskatchewan since 2010. However, we're seeing more fine particulates ($PM_{2.5}$) in the air, mainly due to more frequent and more extreme forest fires in Saskatchewan and across Canada.

Particulate matter has increased in recent years, mainly due to extreme forest fire activity in Saskatchewan and across Canada.

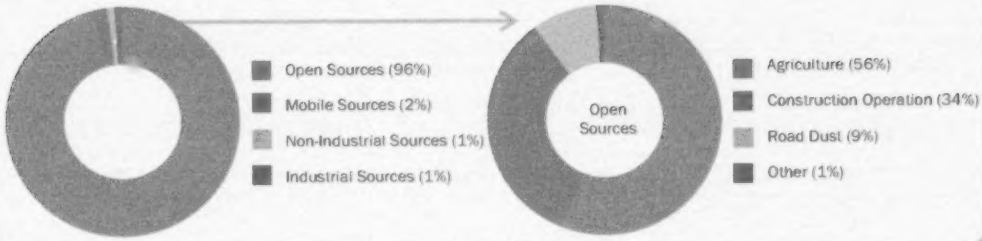
Saskatchewan $PM_{2.5}$ Emissions by Sector, 2014



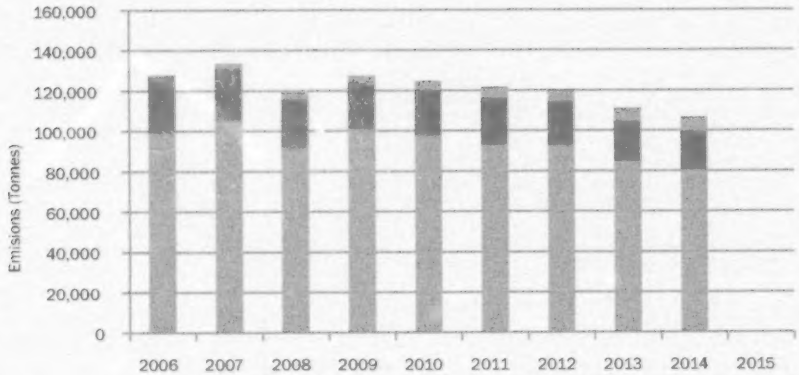
	2006	2007	2008	2009	2010	2011	2012	2013	2014
Industrial Sources	5,108	5,045	4,723	3,975	4,894	4,847	4,655	4,863	4,823
Non-Industrial Sources	3,213	3,126	2,917	2,866	2,745	2,470	2,361	2,299	2,232
Mobile Sources	9,851	9,712	9,542	8,815	9,684	7,539	6,542	5,996	5,722
Miscellaneous Sources	291	296	288	294	291	291	296	297	296
Open Sources	296,217	292,053	292,584	293,979	302,582	327,528	344,609	338,239	334,528

$PM_{2.5}$ Emissions Across Canada

Saskatchewan $PM_{2.5}$ Emissions by Sector, 2014

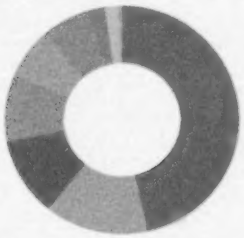


Saskatchewan SO_2 Emissions



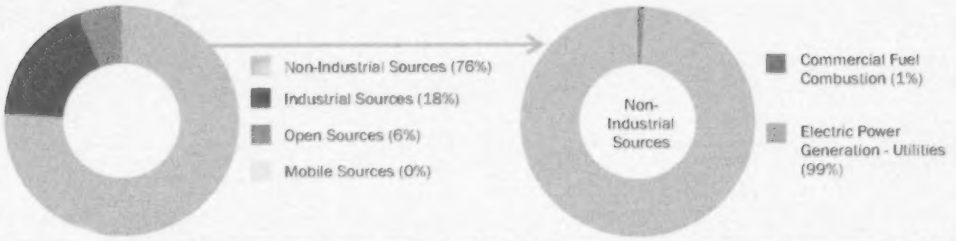
	2006	2007	2008	2009	2010	2011	2012	2013	2014
Industrial Sources	28,173	26,310	24,540	23,012	22,538	23,327	21,691	20,008	19,394
Non-Industrial Sources	99,076	105,005	91,324	100,975	97,569	92,815	92,601	84,464	80,397
Mobile Sources	441	194	156	133	161	155	147	146	147
Incineration Sources	8	8	7	7	7	7	6	6	6
Open Sources	25	1,820	2,703	2,948	4,327	4,957	5,057	6,286	6,290

SO_2 Emissions Across Canada

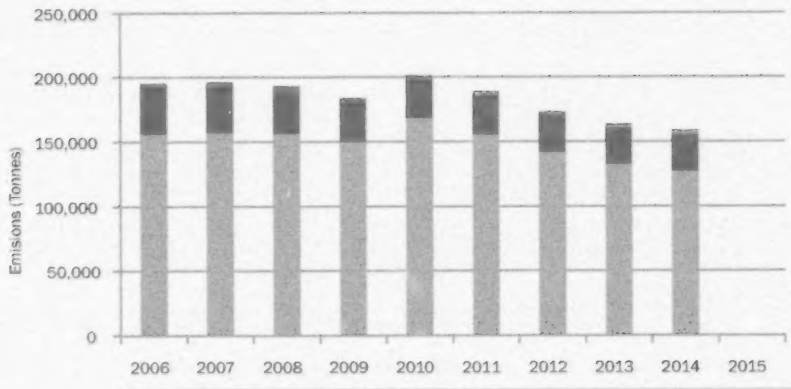


- Alberta (25.5%)
- Ontario (22.7%)
- Manitoba (13.9%)
- Quebec (10.8%)
- Saskatchewan (9.3%)
- British Columbia (6.9%)
- Nova Scotia (6.6%)
- Newfoundland (2.2%)
- New Brunswick (1.9%)
- Prince Edward Island (0.1%)
- Northwest Territories (0.1%)
- Nunavut (0.1%)
- Yukon (0%)

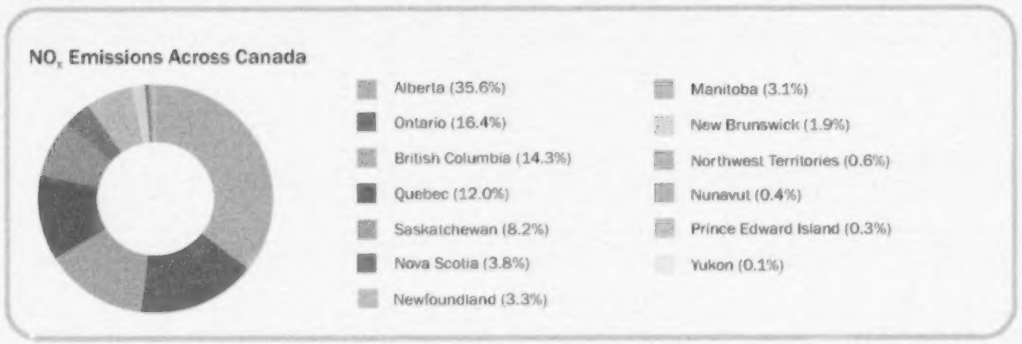
Saskatchewan SO_2 Emissions by Sector, 2014

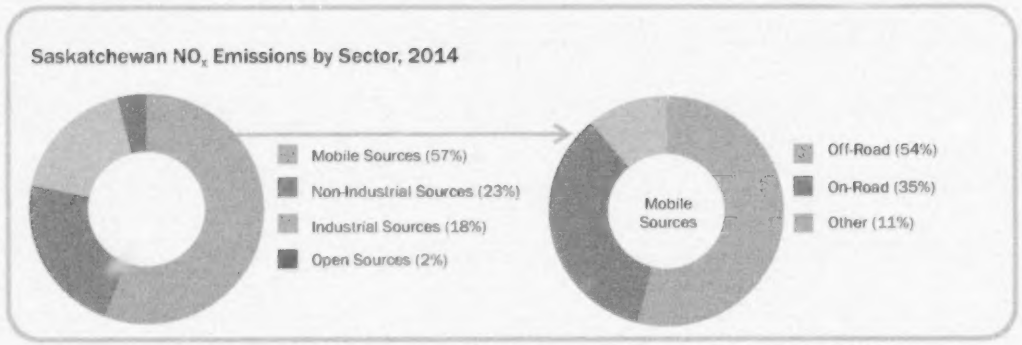


Saskatchewan NO_x Emissions



	2006	2007	2008	2009	2010	2011	2012	2013	2014
Industrial Sources	38,951	38,055	35,553	33,051	31,808	31,511	29,691	29,169	28,817
Non-Industrial Sources	36,869	40,643	39,917	42,949	47,144	39,508	40,014	36,873	36,030
Mobile Sources	118,425	115,888	115,954	106,179	120,820	115,696	101,374	94,922	90,838
Incineration Sources	9	9	9	9	9	9	7	7	7
Miscellaneous Sources	2	2	2	2	2	2	2	2	1
Open Sources	979	1,306	1,469	1,672	1,721	1,763	1,974	2,237	2,494





What we are doing

The Ministry of Environment supports Canada's National Pollutant Release Inventory (NPRI) program. NPRI collects, stores and distributes annual air emissions figures from all reporting sources. Our province is also an active member of Canada's Emissions Working Group. Its mandate is to coordinate the reporting of national trends and projections for future air pollution concentrations.

Saskatchewan has a number of tools available to help keep air quality high. That includes the province's Environmental Code, introduced on June 1, 2015. Also available is *The Environmental Management and Protection Act, 2010.* The Act calls for the preparation of an environmental protection plan for every major emissions source. Companies must make sure their operations meet Saskatchewan's air quality standards. This guarantees emissions do not harm air quality, the environment or human health. By January 1, 2020, all Saskatchewan companies that hold a valid clean air permit must have a ministry-approved environmental protection plan in place.

These emitters will be the subject of ministry inspections and compliance audits. Infractions will be investigated and enforcement actions will be put in place when warranted.

Saskatchewan released new air quality standards on June 1, 2015. The new standards replace outdated regulations and are more stringent than the rules they replace. The new standards also bring Saskatchewan in line with limits in place for other western provinces.

The federal government will also publish new standards this year for sulphur dioxide and nitrogen oxide levels. These new standards come as part of the requirements under *Canada's Environmental Protection Act, 1999*. The new regulations were developed following discussions with major industrial associations, non-governmental agencies and indigenous organizations. These new standards will replace ones that are 40 years old, and considerably less stringent than those in other countries.

Air Pollutant Concentration

Why it matters

Measuring and evaluating the concentration of air pollution across Saskatchewan is a vital activity. These measurements allow the creation of long-term trends, making it easier to identify and track significant changes in our environment.

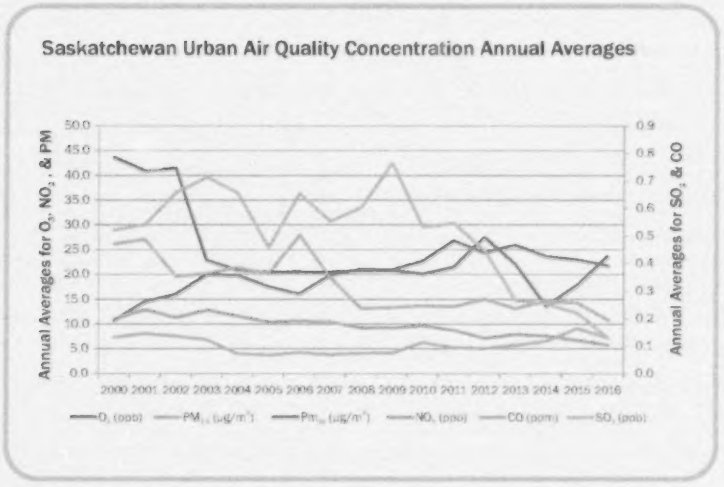
What is happening

Air quality across Saskatchewan is, on the whole, very good. Pollution levels are dropping. Sulphur dioxide and carbon monoxide (CO) levels have always been quite low. This has been the case since 2000. Nitrogen dioxide (NO_2) levels continued to decline from 2000 to 2016. Particulates of 10 micrometers or smaller (PM) dropped significantly in 2003 and have been dropping since that time.

Fine particulate matter, 2.5 micrometers or smaller, has been increasing slightly since 2010. This is due to forest fires in British Columbia, the Northwest Territories and Montana. These fires cause a short-term reduction in air quality. Were it not for these fires, the concentration of fine particulate matter in Saskatchewan air would actually be dropping.

Unfortunately, the improvements we have seen in Saskatchewan's overall air quality do not extend to ozone (O_3). Ozone levels continue to go up, despite cuts in pollution that contribute to ozone formation. There are a number of theories to explain this, including a rise in average background ozone concentrations.

Air quality in Saskatchewan is primarily very good and pollution levels are improving for most pollutants.



What we are doing

Saskatchewan makes sure new industries use the best available technology to reduce air pollution. We have seen significant population growth in our province. However, emission levels are still dropping and air quality is improving.

Continuous air quality monitoring takes place at five locations in our province: Regina, Saskatoon, Prince Albert, Swift Current and Buffalo Narrows. More air monitoring stations will be in place soon. Real-time information from these monitoring sites is available to the public under Outdoor Air Quality at saskatchewan.ca/environment.

Saskatchewan also has a mobile air monitoring lab. This vehicle can monitor a variety of air pollutants and has done a series of random studies in smaller communities. These studies can identify new pollutants before they become a significant problem. Results from the Saskatchewan Air Monitoring Laboratory are made public on the ministry's website.

Saskatchewan's Air Monitoring Lab (SAML) has conducted a number of studies across the province.

Feature Stories about Air

Ethanol plant reduces odours and emissions

Terra Grain Fuels is an ethanol plant located in Belle Plaine, Saskatchewan. It produces clean-burning ethanol, which is blended with gasoline to reduce carbon emissions from our cars and trucks. Terra Grain Fuels installed new equipment on their grain dryers to reduce odours and other emissions by 98 per cent.

These special oxidizers will cut emissions by more than 650,000 kilograms. That's roughly equal to all of the emissions produced by all of the trains operating in our province for an entire year.

The Terra Grain Fuels facility in Belle Plaine is focused on protecting the environment.

K + S Breaks New Ground In Environmental Approval Process

K + S Potash Canada is completing its Legacy Project in southern Saskatchewan. It's the first new potash mine in more than 40 years in a previously un-mined area in Saskatchewan.

K + S received its environmental approvals in November of 2010. One of the approvals the company received is for an Industrial Air Source Environmental Protection Plan (EPP). This EPP is the first ever for a major industrial facility in Saskatchewan.

The new Saskatchewan Environmental Code, which ca e into effect June 1, 2015, calls for Environmental Protection Plans for new projects. They contain specific requirements calling on companies to demonstrate their emissions will meet new limits and air quality standards.

The K+S Potash Canada mine facility in southern Saskatchewan is setting industry precedent for meeting new standards.

Boundary Dam cleans up coal

Saskatchewan gets most of its electricity through burning coal. New federal rules call for those coal-fired plants to be far more efficient. They must emit less than 420 kg of greenhouse gases for every megawatt hour of electricity produced.

In order to meet those new stringent rules, Saskatchewan has put in place leading-edge technology at the Boundary Dam Carbon Capture and Storage (CCS) project. Boundary Dam CCS is a partnership between the Governments of Canada, Saskatchewan and various private-sector companies. A coal-fired generating station has been completely rebuilt using CCS technology. The carbon secured at Boundary Dam can be used in enhanced oil recovery or it can be stored in a deep saline aquifer.

Boundary Dam is the largest plant of its kind in the world. Since it started operating in late 2014, Unit 3 has captured more than 1.4 million tonnes of CO2. That's the same as taking 350,000 cars off Saskatchewan roads. Unit 3 is the cleanest-burning fossil fuel plant in Canada, producing half the emissions of a natural gas generating station.

Boundary Dam is just the beginning of the story for SaskPower. The Crown-owned utility plans to increase renewable generating capacity to 50 per cent by 2030. It will use sources such as wind and solar. Once this happens, SaskPower will record a 40 per cent reduction in greenhouse gas emissions by 2030, when compared to 2005 levels.

Aquistore is an independent research and monitoring project to store carbon in a deep geologic formation near the Boundary Dam power plant.

habitat

Over half of Saskatchewan is covered by trees. Forests are important economically and environmentally. They provide Saskatchewan with timber and other products. The boreal forest stores carbon and purifies air and water while helping to regulate our climate. Roughly 28 per cent of the world's boreal forest lies in Canada. The benefits this forest provides go far beyond our borders. Sustainable management of this important resource is crucial. Our forests must be managed in a way that balances the goal of environmental protection, social good and economic development.

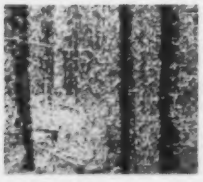
Forestry is northern Saskatchewan's second largest industry. In normal market conditions, the forest industry generates more than $1 billion in forest product sales, $800 million in exports and 6,000 direct jobs.

Key Indicators

Effective Forest Renewal

A sustainable forest economy is not possible without a healthy forest. Find out what percentage of harvested forest areas in Saskatchewan have been successfully regenerated. *(see page 16)*

Forest Type and Age

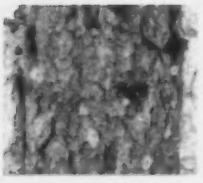


The Ministry of Environment works to determine the historical distribution of age classes and forest types. Find out how old our forests are, and how they're kept healthy and resilient. *(see page 18)*

Wildfire Disturbance

Healthy, vibrant forests are naturally renewed by fire, or through forest harvesting practices that follow the disturbance patterns created by wildfires. However, action to suppress wildfires that threaten communities or property is still the appropriate response. Get information on Saskatchewan's approach to managing forest disturbance and wildfire. *(see page 20)*

Insect and Disease



What insects and diseases affect Saskatchewan forests, and how do we manage these risks? Learn more about the province's Forest Insect and Disease Strategic Action Plan. *(see page 22)*

Proportion of Provincial Annual Cut

A sustainable forest products industry depends upon a sustainable timber harvest. This indicator compares the actual volume of timber harvested to the available volume. Get Saskatchewan's harvest rates and history. *(see page 24)*

Effective Forest Renewal

Why it matters

The long-term health of our forests depends on regrowth after natural disturbances or harvesting. Forests that are not renewed quickly lose their commercial value. That hurts northern communities and the northern economy. Forests that are not renewed properly may also become ecologically different than forests found in the natural landscape

A sustainable forest economy is not possible without a sustainable, healthy forest.

MYTH: LOGGING CAUSES DEFORESTATION
FACT: HARVESTING TREES DOES NOT CAUSE DEFORESTATION
Deforestation means that forests are permanently removed so the land can be used for something else. Harvesting, wildfires and insect infestations do not cause deforestation, since the affected areas will eventually grow back.

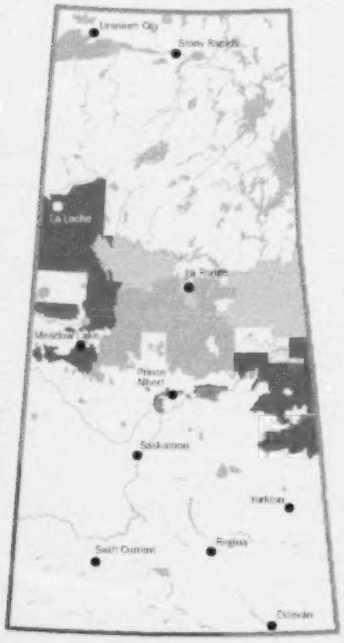
What is happening

The Government of Saskatchewan routinely checks on reforestation efforts for each timber licence granted. For an area to be considered sufficiently regenerated, trees must cover at least 80 per cent of the growing area. These trees must also be at least 30 cm tall at seven years of age, or 1.5 metres tall at 14 years of age.

About 95 per cent of harvested forest land in Saskatchewan has been successfully regenerated.

A forest management agreement (FMA) is a 20-year agreement, typically with a large forest company, granting long-term harvesting rights for a specific volume of timber from a defined area, as well as responsibilities for long-term sustainable forest management.

FMAs by Regeneration Percentage



99% or more regenerated

95% - 98% or more regenerated

89% - 94% or more regenerated

67% regenerated

Saskatchewan's Crown Forest Areas - Industry's Regeneration Status

PROVINCIAL FOREST AREA	HARVEST PERIOD	HARVEST AREA (ha)	Survey AREA (ha)	REGENERATION STATUS			
				Sufficiently Regenerated Area SR		Not Sufficiently Regenerated Area (NSR)	
				Total (SR) * (ha)	%	Total NSR (ha)	%
PP FMA	2004/05 to 2014/15	41,077	20,176	20,175	100%	1	0%
PA FMA	2004/05 to 2014/15	72,768	29,419	26,068	89%	3,351	11%
Mistik FMA	2004/05 to 2014/15	49,455	25,689	25,641	100%	48	0%
L&M FMA	2004/05 to 2014/15	7,404	5,647	5,647	100%	0	0%
Meetoos TSL	2004/05 to 2014/15	2,954	1,199	1,168	97%	31	3%
Kitsaki-Zelensky TSL	2004/05 to 2014/15	2,645	2,645	2,513	95%	132	5%
NW	2004/05 to 2014/15	237	8,400	8,224	98%	176	2%
Turnor TSL	2004/05 to 2014/15	0	0	0	0%	0	0%
Island Forests	2004/05 to 2014/15	4,252	2,179	1,451	67%	728	33%
Meadow Lake OSB TSL	2004/05 to 2014/15	5,422	2,716	2,716	100%	0	0%
Total		186,213	98,070	93,603	95%	4,467	5%

Updated November 8, 2016.

What we are doing

Anyone who wants to harvest timber must commit to renewing the forest. They must follow the standards outlined in Saskatchewan's Environmental Code. A survey must be conducted between four and seven years after harvest. If regeneration is found to be lacking, the company must develop a plan to fix the problem.

The Saskatchewan Environmental Code includes a Forest Regeneration Assessment Chapter and Standard, effective January 5, 2015.

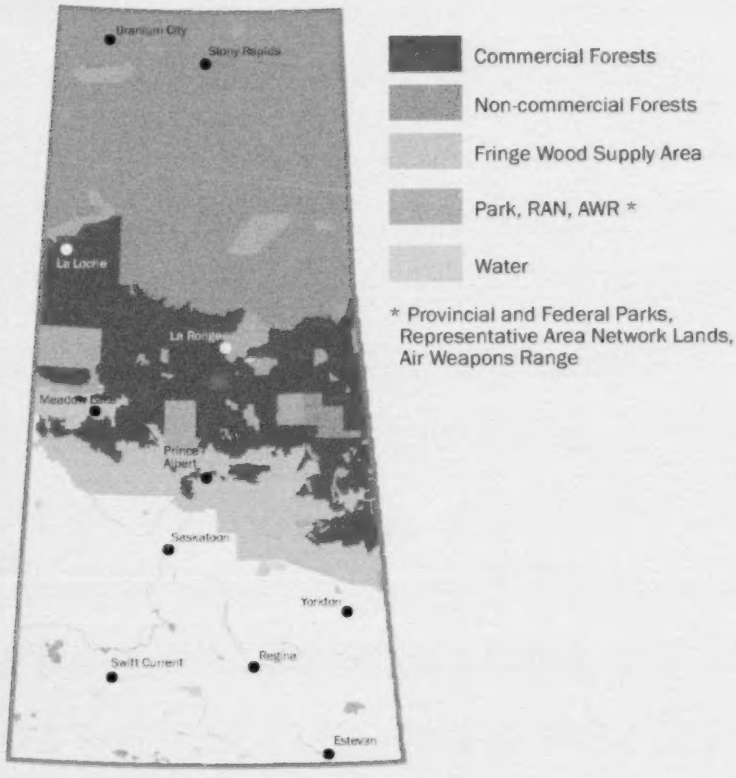
Forest Type and Age

Why it matters

The age of a forest is an important factor to consider, when trying to manage these resources. Animals and plants rely on forests of different ages for habitat. If Saskatchewan has too many young forests, caribou have nowhere to live. If there are too many old forests, the risk of wildfires becomes much higher. Older forests are also much more susceptible to disease. Given these factors, it is important for the Ministry of Environment to carefully monitor forest type and age. Ultimately, our forests must be managed in a way that protects habitat, recreational opportunities and economic growth.

The provincial forest covers the northern half of the province, an area of about 34.3 million hectares, or 53 per cent of the province.

Saskatchewan Forest Zones

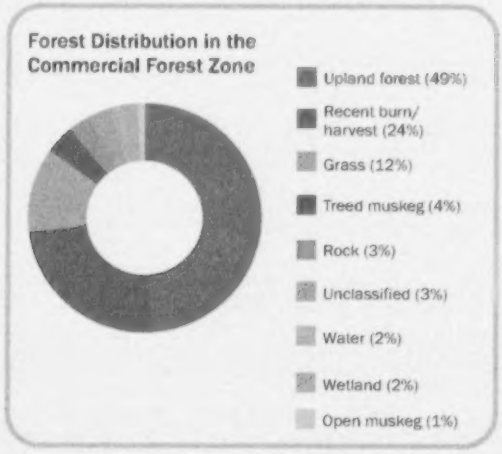


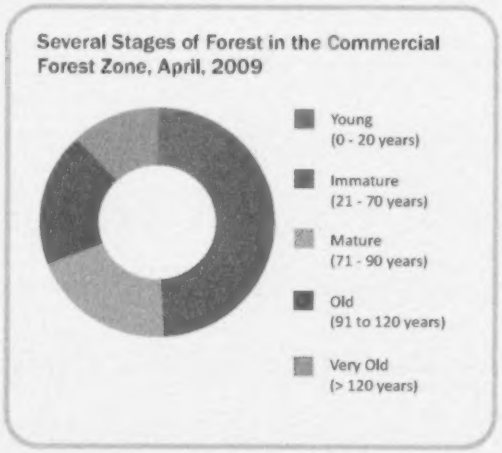
What is happening

Approximately half of the commercial forest zone is upland forest, which is valued for harvesting.

More than half of the commercial forest is classified as mature (70 to 90 years old), old (91 to 120 years old), or very old (120-plus years old). The successful protection of the mature and old forest types at these levels can be attributed to wildfire fighting efforts.

From 2009 to 2014, an estimated 258,000 hectares of forest have been disturbed by wildfire, wind and harvesting. This means that two per cent of the commercial forest moved from an older to a younger classification over that five-year period.




Several Stages of Forest in the Commercial Forest Zone, April, 2009
Young (0 - 20 years)
Immature (21 - 70 years)
Mature (71 - 90 years)
Old (91 to 120 years)
Very Old (> 120 years)

Forest Types (ha) in the Commercial Forest Zone, April, 2009
Black Spruce - Tamarack (1,602,000)
Trembling Aspen - Birch (1,525,000)
Black Spruce - Jack Pine (948,000)
Jack - Lodgepole Pine (459,000)
Hardwood - Spruce (378,000)
Spruce - Mixed Wood (255,000)
Pine - Mixed Wood (241,000)
Hardwood - Pine (213,000)
White Spruce - Balsam Fir (136,000)
Hardwood - Non Aspen (115,000)

What we are doing

Saskatchewan has developed a tool that can be used to identify the type, extent and condition of vegetation in a forest. The Saskatchewan Forest Vegetation Inventory (SFVI) standard is an effective means of tracking where changes are taking place and what those changes are. These inventories are used by government, forest management agreement holders and other clients. They can be used to refine forest management practices, conduct an analysis of the potential wood supply and to monitor biodiversity. The inventory is also useful for wildlife habitat classification and carbon modelling.

The ultimate goal of these activities is to maintain a forest of varying ages that is both resilient and healthy. The Ministry of Environment is working with other provinces and agencies to establish management targets. These targets will help in maintaining a variety of forest types and the preferred range of forest ages.

Wildfire Disturbance

There were 720 wildfires in Saskatchewan in 2015.

Why it matters

Healthy, vibrant forests can be renewed in different ways. They are renewed by fire. Renewal can also be achieved through harvesting practices that mimic the natural patterns created by wildfires. Some experts are predicting wildfire activity will increase globally, due to climate change. This can result in more intense burning conditions. New research suggests wildfire smoke is not as significant a contributor to climate change as other greenhouse gases.

What is happening

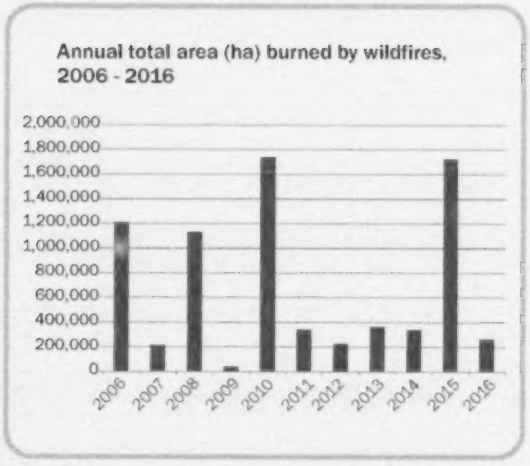
Over the last 10 years, half the wildfires in Saskatchewan were caused by humans and the other half were natural wildfires caused by lightning. In 2015, lightning caused about half of all our wildfires but accounted for almost 97 per cent of the total area burned. The total area burned by wildfires each year in Saskatchewan is extremely variable. In some years, burn areas are small. In other years, more than one million hectares have been affected. This variability can be due to normal changes in weather patterns, especially precipitation and temperature.

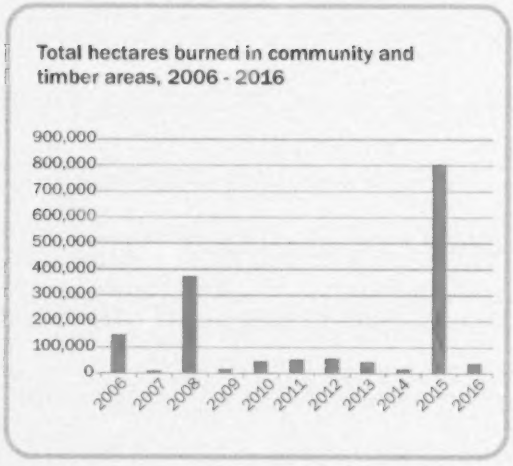
Number of Wildfires and Area Burned

NUMBER OF WILDFIRES/YEAR			AREA BURNED (ha)			Percentage of Total Area Burned	
Year	Number of Wildfires	Wildfire Cause (% lightning)	Community and Timber Areas	Area North of the Primary Timber Area	All Areas	% of Wildland Urban Interface Wildfires	% of Area North of Primary Timber area
2016*	364	53%	14,289.60	227,318.20	241,607.80	6%	94%
2015	720	52%	678,727.80	1,043,882.60	1,722,610.40	39%	61%
2014	397	49%	15,679.60	327,750.40	343,430.00	5%	95%
2013	429	37%	43,663.30	320,151.20	363,814.50	12%	88%
2012	409	49%	16,116.70	211,394.70	227,511.40	7%	93%
2011	303	21%	53,152.07	290,567.92	343,719.99	15%	85%
2010	571	40%	13,657.92	1,721,140.88	1,734,798.80	1%	99%
2009	511	36%	15,769.73	21,789.44	37,559.17	42%	58%
2008	599	47%	385,432.07	744,747.99	1,130,180.06	34%	66%
2007	370	36%	1,203.75	211,709.47	212,913.22	1%	99%
2006	501	66%	134,087.20	1,069,641.30	1,203,728.50	11%	89%
10 Year Average (2006-2015)	481.6	47%	135,751.31	596,277.59	732,028.91	16.70%	83.30%

*Note: as at October 27, 2016**

HOW BIG IS A HECTARE? A hectare is 10,000 square metres, or roughly the size of a baseball field. The 2015 wildfire season burned an area of 1.722 million hectares.





What we are doing

The Ministry of Environment's wildfire management strategies are designed to protect the things most important to people: human life and communities. The ministry's strategy also considers wildfire's natural and beneficial role on the landscape. This balanced approach reduces the extreme costs associated with attempting to suppress all wildfires.

Other elements of the provincial wildfire strategy include:

- daily public reporting of the current status of wildfires during the wildfire season;
- fire bans during periods of high wildfire risk;
- the operation and maintenance of weather and fire observation towers;
- wildfire education and prevention programs; and
- suppression expertise that includes ground and air operations.

Wildfire management strategies direct the way the province responds to wildfires. New forest fires are mapped every year, adding to a database of landscape disturbances caused by wildfire in northern Saskatchewan. This record goes back 60 years and is an important planning tool for understanding the impact of wildfire on timber allocations and wildlife management.

Insects and Disease

Saskatchewan has a Forest Insect and Disease Strategic Action Plan.

Why it matters

Saskatchewan's boreal forest contains a wide variety of insects and diseases. They are all an important part of the forest. They play a part in determining the composition of forest species. They also define the way all parts of the forest ecosystem interact with each other.

Insect and disease populations in the forest change due to the effects of parasites, predators, suitable host numbers and climatic conditions. When conditions are favourable, insect and disease populations grow very rapidly and can reach epidemic levels.

The impacts of climate change and changes in annual weather patterns may affect the numbers and distribution of native and invasive forest pests. Range expansion and changes in biology, length of season and outbreak duration and frequency, can magnify economic and environmental impacts over time.

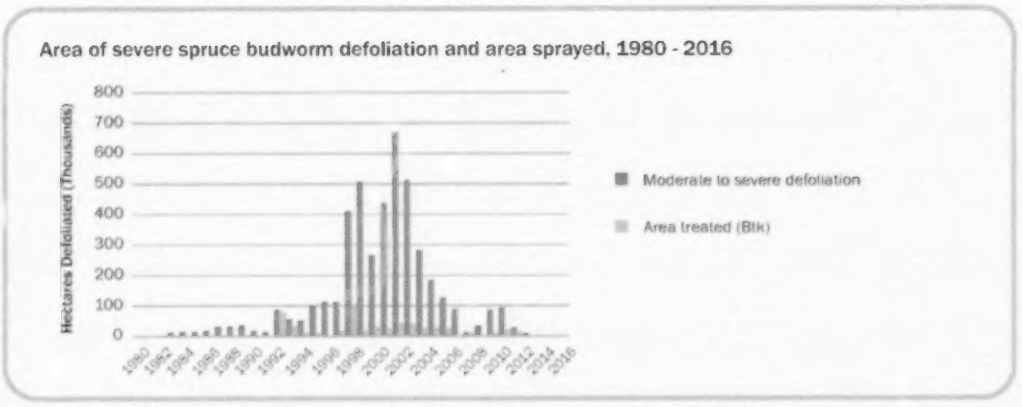
What is happening

Spruce Budworm

The spruce budworm (Choristoneura fumiferana) is a periodic defoliator of spruce and Balsam Fir trees across Canada. Outbreaks typically last from 10 to 12 years with approximately 30 years between outbreak peaks. The last outbreak in Saskatchewan ran from 1982 to 2012 and created large areas of severe defoliation.

Selected areas were treated with Btk (Bacillus thuringiensis kurstaki), a reduced-risk pesticide that uses a naturally occurring soil bacterium as the active ingredient. To be effective it must be eaten by the target caterpillars. The strain used against spruce budworm in Saskatchewan is harmless to beneficial insects such as bees and does not affect fish and animals. Vulnerable spruce stands were selected for treatment to reduce the impact of spruce budworm and protect high-value forest stands.

Since 2002, defoliation by the spruce budworm has gradually declined. The infestation reached its peak in 2002 and returned to pre-outbreak levels by 2008. Aerial surveys in 2014, 2015 and 2016 show no areas of defoliation for the first time since the early 1990s.



Mountain Pine Beetle

The most significant forest insect threat to pine forests in Western Canada is the mountain pine beetle (Dendroctonus ponderosae). Outbreaks of mountain pine beetle have occurred in the Cypress Hills. The previous outbreak took place in the 1980s and collapsed by 1984. There is a current outbreak that began in 2007, and that peaked in 2014 and now is in a declinie. Although this insect is native to the lodgepole pine forests of the Cypress Hills area, it is not native to the boreal forest ecosystems of northern Saskatchewan. Typically, mountain pine beetles attack over-mature, stressed and weakened trees. When populations grow, widespread epidemics that kill millions of hectares of healthy forest can occur. Research has shown that the mountain pine beetle can colonize and breed in jack pine forests. It is a significant risk to jack pine across Canada.

Since 2009, the mountain pine beetle has spread slowly through Alberta. The risk of mountain pine beetle continuing to spread eastward and establishing in Saskatchewan's boreal jack pine forests is the primary threat to sustainable forest development. Saskatchewan continues to work in partnership with Alberta to restrict mountain pine beetle from spreading eastward into our northern forest.

Annual surveys are conducted to monitor and map the area, extent and severity of disturbances across the forested parts of the province. Aerial surveys are conducted each July, and affected areas are mapped. Insect and disease damage detected during aerial surveys is verified on the ground.

What we are doing

Saskatchewan has strategic planning in place to manage forest insects and disease. This planning identifies the resources needed to monitor and control insects and diseases. This includes a mountain pine beetle strategy for Saskatchewan. As part of this strategy, a pine forest inventory south of Meadow Lake Provincial Park has been developed. This expanded inventory helps us to understand the distribution and extent of vulnerable pine forests. Saskatchewan has the opportunity to focus on preventative approaches instead of solving problems after they occur.

Saskatchewan bans the transport and storage of pine forest products with bark attached from British Columbia, Alberta and the United States. In 2002, the Government of Saskatchewan set regulations to prevent the spread of mountain pine beetle into the province. In July 2008, this restriction order was strengthened by designating the mountain pine beetle as a pest under *The Forest Resources Management Act*. The 2008 order also designated lands where the transportation ban is to be enforced. This gave provincial officials greater powers of inspection and broader tools to prevent the beetle's spread.

Proportion of Provincial Annual Cut

The harvest volume schedule is the maximum timber volume that can be sustainably harvested each year.

Why it matters

A sustainable forest products industry depends on a sustainable timber harvest. To determine sustainability, the actual volume of timber harvested must be compared to the available volume. The available volume is referred to as the annual allowable cut (AAC), which is the maximum timber volume that can be sustainably harvested each year.

Sustainable harvest levels are determined using forest models over a 200-year timeframe, or about two harvest rotations. Keeping the annual harvest level under or equal to the annual allowable cut is one of the principles of sustainable forest management.

Some of the considerations used when determining the annual allowable cut include:

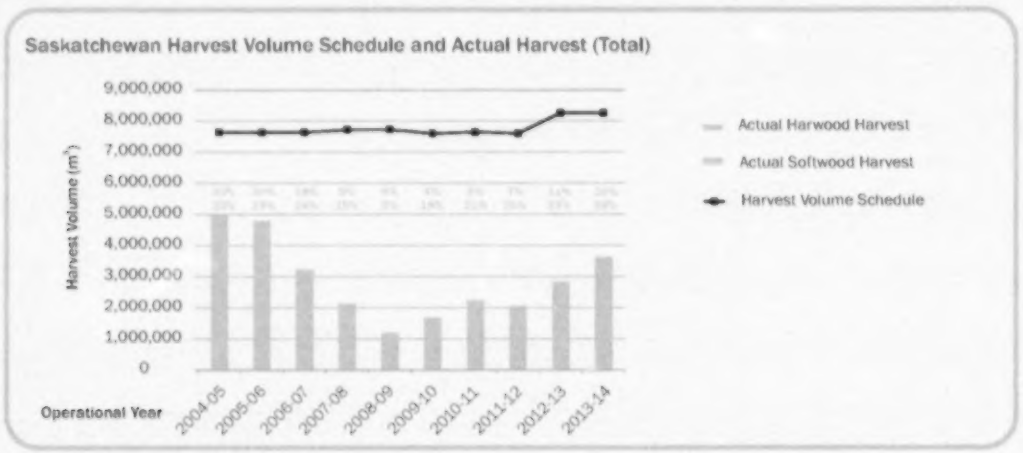
- how forests change over time;
- the rate of growth and yields of commercial tree species;
- the impact of fire and other natural elements in boreal forests;
- forest land dedicated to other uses that prevent or limit harvesting;
- harvest practices that are operationally feasible;
- the success of forest regeneration efforts; and
- consultations with the public about the importance of forest values to be maintained.

What is happening

The available volume of timber in Saskatchewan has remained relatively constant over the past 10 years. Between seven and eight million cubic metres of timber has been allowed to be harvested each year, during this period. Calculations are made for each individual timber supply area. The amount of wood actually removed depends on a number of factors, including quality, transportation costs and the availability of needed infrastructure.

The annual timber harvest in Saskatchewan has been far less than what's allowable in recent years. These low harvest levels are the result of depressed prices and the global recession. Recently, actual harvest levels have been increasing, as our forest sector rebounds. For 2015-2016, Saskatchewan's total harvest volume was 3.67 million cubic metres.

Harvest rates are currently sustainably managed. To ensure forests are well managed, the ministry has controls at local and regional levels. One example is where management is in place with white spruce and other species found close to existing mills. Demand for white spruce and for timber close to mills can lead to unsustainable harvest rates. These issues come into play when determining harvest rates for the future.



What we are doing

Standards are reviewed as part of the development of the 20-year forest management plans. These plans are being developed under the Saskatchewan Environmental Code. Reviews are done to ensure that sustainable harvest levels are consistent with long-term management objectives.

Feature Stories about Habitat

Environmental Code introduces forest management planning chapter

Forest management plans help balance social, economic and environmental factors. They are designed to help reconcile competing interests while promoting habitat. Achieving this complex balance in turn supports Saskatchewan's Plan For Growth.

These plans consist of three primary components, which are typically developed over a two-year period.

1. Gathering background information on the forest area over the previous planning period to provide accurate forecasts into the next planning cycle.

2. A digital planning inventory that includes a forest development report and a forest estate modelling report. These documents are used to establish the sustainable volume of timber that can be harvested annually.

3. A tactical plan that identifies where harvesting will occur during the 20-year period covered by the plan.

As companies put their forest management plan into practice, they report progress to the public through annual reports. The Government of Saskatchewan monitors companies on their performance and adherence to their commitments.

Provincial Direction

The Forest Resources Management Act (FRMA) calls for the creation of forestry management plans. This requirement applies to all forest management agreement holders or other area-based licence holders. The Government of Saskatchewan approves these plans under the Act. This constitutes approval under *The Environmental Assessment Act* also.

In 2015, the government introduced the Saskatchewan Environmental Code. This was done to support a new results-based regulatory model. The code is divided into chapters covering a variety of resource management and protection activities. Forest management planning has its own chapter in the new code.

Engagement, consultation and habitat plans are key to protecting woodland caribou

Woodland caribou are listed as threatened under the federal *Species at Risk Act.*

Woodland caribou are an important resource and symbol to northern people, and caribou populations reflect the health of the landscapes and ecosystems.

A member of the deer family, woodland caribou are found throughout Saskatchewan's northern forests. The boreal population of woodland caribou is listed as threatened under the federal *Species at Risk Act.* As required by the Act, Environment and Climate Change Canada created a national recovery strategy that applies to two territories and seven provinces, including Saskatchewan.

The development of a Saskatchewan-based solution to best manage the landscape for both a sustainable caribou population and continued economic development is key for the province.

In 2016, the Ministry of Environment continued work on the Woodland Caribou Range Assessment and Range Planning Project, focusing on several key areas:

Range Planning

A foundational component of the program, range planning is focused on engaging stakeholders from industry, non-government organizations, municipalities and First Nations and Métis communities to ensure consultation obligations are met during the range planning process.

In 2015, range planning was initiated across the province, with a focus on the central Boreal Plain and the ministry is on track to adopt a base range plan in October 2017. Range management and plan refinements will be applied across the province in subsequent years.

Range Assessment and Research

The Woodland Caribou Range Assessment Program incorporates research to help determine the status of woodland caribou populations and habitat and provide important data for range planning. Research projects are examining population status, structure and distribution, and habitat availability and use.

Population Dynamics Study

In November 2016, the initial results from collared caribou research conducted by the University of Saskatchewan show some encouraging signs with respect to woodland caribou populations in the province's boreal shield. Led by ecologist Dr. Philip McLoughlin, researchers have found that the woodland caribou population in northern Saskatchewan is stable and has been slightly increasing over the past two years, and is one of the largest woodland caribou populations in all of Canada. These findings are contained in an interim report of a five-year study into the population dynamics and critical habitat of woodland caribou in northern Saskatchewan. The research will wrap up in 2018.

Aboriginal Traditional Knowledge

Research is also underway in sharing and documenting of traditional knowledge with various First Nations and Métis communities across the woodland caribou range. In 2016, this continued with the English River and Canoe River First Nations. This information will help facilitate caribou habitat mapping and modelling.

Population Genetic Analysis

Another component of the research program is the collection of caribou droppings (fecal pellets) at sites recently used by caribou to obtain the genetic identity of the caribou. This information is then used to determine how closely individuals of a band of caribou are related and how closely different bands are related to each other across Saskatchewan and Western Canada. This research is focused on the Boreal Plain and will continue in early 2017.

HABISask is on the map

There is a new way to explore the natural world in Saskatchewan: on your computer, phone or tablet. HABISask is an online mapping tool that brings hunting, angling and biodiversity information together in one place.

Whether the people of Saskatchewan are planning a hunting or angling trip, exploring wildlife sightings or working on an environmental assessment, HABISask is for you. HABISask offers mapping information and tools based on four map themes:

- **Hunting** includes wildlife management zones, game preserves, road corridor game preserves, wildlife refuges, bird sanctuaries, wildlife biologist management areas and conservation officer field offices.
- **Angling** includes waterbody locations, fish species presence, fish stocking history, special regulations, bathymetric (underwater depth) map links, fisheries management zones, fisheries biologist management areas and conservation officer field offices.
- **Project screening** includes rare and endangered species observations and ecological protection specialist districts.
- **Wildlife viewing** includes managed areas, the Saskatchewan Bird Atlas and ecoregions.

land

Saskatchewan is rich in farmland, forests and natural resources. These resources are used in a variety of ways that provide many opportunities for growth and job creation. In order to maintain healthy ecosystems, environmental protection must be balanced with economic growth. This is the Ministry of Environment's role.

Monitoring and implementation of effective land-use management practices is the best way to maintain that balance and assure a healthy environment far into the future. Governments have the task of making decisions on how best to manage and allocate land. Federal, provincial, First Nations and municipal governments all share this important responsibility.

Leadership and innovation on the part of various governments and industry players is moving Saskatchewan towards an effective results-based approach to land management. Issues such as habitat conservation, agricultural impacts and

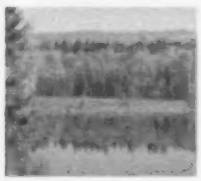
Leadership and innovation from government and industry are moving the province towards an effective results-based approach to environmental management.

Key Indicators

Waste Recycling

Saskatchewan has the highest return rate of all beverage container programs in Canada. Find out how many people returned their containers, and get information about the many other provincial recycling programs. *(see page 29)*

Private Land Stewardship



Private conservation organizations and individuals play an important role, not only in maintaining and conserving natural areas through their activities, but also in providing broader social and economic benefits to the people of Saskatchewan. *(see page 31)*

Agricultural Land Cover

Learn about Saskatchewan's innovative agricultural practices that are contributing to biodiversity, soil conservation and habitat availability. *(see page 31)*

Waste Recycling

Why it matters

One way to reduce pressure on the environment and sustain scarce resources is to divert waste before it gets to landfills. Much of what we describe as trash or waste is a valuable resource. Less waste means better landfill management and less pressure on natural resources. It also means lower carbon emissions. Recycling is an indicator of public commitment to share in the responsibility for environmental stewardship.

Wondering where to recycle or safely dispose of waste in Saskatchewan? Visit the Sask Waste Reduction Council online

What is happening

In 2015 - 2016, Saskatchewan people recycled 86 per cent of all deposit-paid, ready-to-serve beverage containers sold in the province. This makes Saskatchewan the province with the highest return rate of all beverage container programs in Canada.

In 2015, the Saskatchewan Paint Stewardship Program collected 422,941 litres of waste paint. This includes more than 80,000 litres of paint collected and reused through the program's paint exchange initiative. Saskatchewan is the leader in paint exchange across Canada.

Saskatchewan had the first industry-led electronics recycling stewardship program in North America. In 2015, more than 2,700 metric tonnes of end-of-life electronics were collected. The program also surpassed the milestone of diverting 25,000 metric tonnes of end-of-life-electronics from landfills since the program's inception in 2007.

Saskatchewan people recycled 86 per cent of all deposit-paid, ready-to-serve beverage containers sold.

In January 2016, Saskatchewan launched the Multi-Material Recycling Program (MMRP) in accordance with *The Household Packaging and Paper Stewardship Program Regulations*. MMRP is a cost-sharing program between businesses and municipalities to help pay for the collection and recycling of household packaging and paper materials. Saskatchewan's MMRP has been operational for just over one year, and now includes 487 municipalities, representing 86 per cent of the population.

In 2015, more than 860,000 tires were collected through the province-wide tire recycling program. Since the program began in 1998, more than 20 million tires have been diverted from landfill disposal, and more than 300 landfill tire stockpile sites have been cleaned up.

In 2015, the used oil recycling program collected and recycled over 19 million litres of used oil, for an annual recycling rate of 69 per cent. Over two million filters were collected, for a 78 per cent recycling rate.

What we are doing

In July 2016, the Saskatchewan government proclaimed *The Agricultural Packaging Product Waste Stewardship Regulations*, setting the backdrop for the development of a new grain bag recycling program. Until then the successful grain bag pilot program, operated through Simply Agricultural Solutions Inc. and funded through the Ministry of Agriculture, will continue. The pilot program recycled 4,923 bags in 2015.

As the economy grows, reducing the amount of waste going to local landfills will improve our environment and maintain our quality of life. In 2015, 19,120,254 litres of waste liquid and 44,817 tonnes of solid waste were diverted from landfills. Some of this material can be turned into recycled products, which will create new business and employment opportunities.

In 2015, 19,120,254 litres of waste liquid and 44,817 tonnes of solid waste were diverted from landfills.

Private Land Stewardship

Why it matters

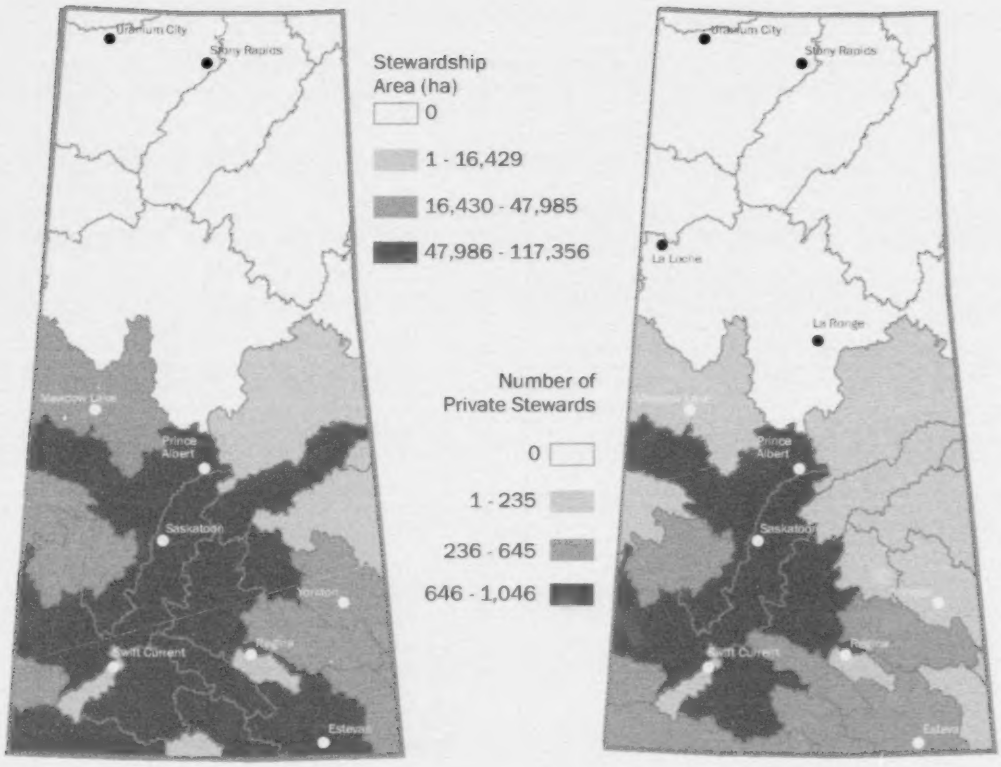
To maintain a sustainable and healthy environment, the Government of Saskatchewan needs help from private conservation organizations. These conservation stewards play an important role in maintaining and conserving natural areas.

Good stewardship is key to protecting land in Saskatchewan.

What is happening

Private land stewardship in the *State of the Environment* is reported as the number of participants in specific programs managed by the Water Security Agency, Agriculture and Agri-Food Canada, and Ducks Unlimited Canada. Agreements between those agencies and private landowners protect specific habitat and environmental attributes.

The conservation stewards and the hectares covered under conservation agreements are the combined total of the stewards in the Prairie Stewardship Program, the Permanent Cover Programs I and II and the Greencover Canada Program. The Greencover Canada Program also reflects the hectares conserved through conservation steward agreements with conservation steward agreements.



What we are doing

As the Ministry of Environment develops a Crown Land Inventory program for the province, the *State of the Environment* will be updated to reflect a broader range of land stewardship options. The work of partner agencies holding conservation easements on private land and the environmental management of Crown land will be included in this indicator in the future.

Agricultural Land Cover

The Census of Agriculture is collected every five years. New data will be available in 2017.

Why it matters

Land use in agricultural areas of the province contribute to biodiversity, soil conservation and habitat availability. While the main intent of farming is food or forage production, land use practices can support wildlife and natural processes. Monitoring trends in agricultural land cover and management practices over time allows us to track whether we are moving towards or away from enhancing biodiversity across the province.

What is happening

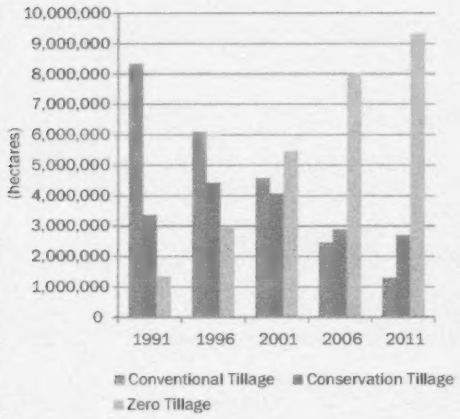
The Census of Agriculture is collected every five years and new data will be available in May 2017. The most recent measures of the overall state of Saskatchewan agriculture are taken from the 2011 Census.

Conservation farming practices such as zero-tillage are producing significant improvements to Saskatchewan's air and water quality, biodiversity conservation and significant carbon storage capacity with 11.4 million tonnes sequestered in 2014. Conventional tillage, conservation tillage and zero-till (or no-till) are defined by the amount of crop residue left on the soil surface.

Up to 50 per cent of the soil's organic matter is estimated as lost in Saskatchewan since cultivation began and before the adoption of more sustainable practices such as conservation and zero-tillage.

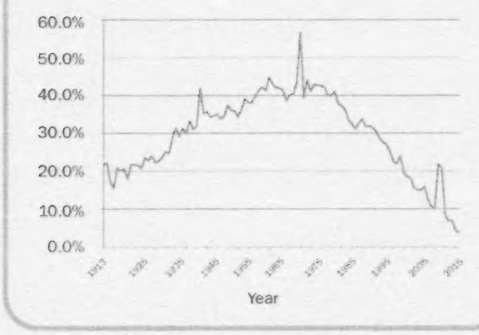
Zero tillage technology and other technological advances, such as GPS,have significantly reduced the amount of fuel, fertilizer and other inputs needed to produce crops.

Conventional, Conservation, and Zero Tillage, 1991 – 2011



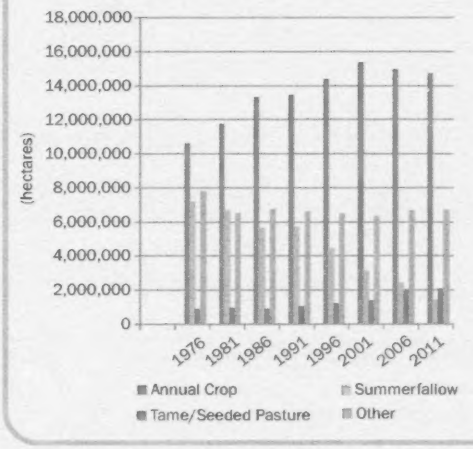
The amount of farmland devoted to annual cropping has steadily grown since the 1970s, while summerfallow has declined. The decline is associated with a growing awareness of the risk of negative environmental effects such as soil erosion, depletion of organic matter and increased soil salinity.

Summerfallow as a Percentage of Total Annual Cropland Hectares, 1913 - 2016



Note: The increase in summerfallow hectares in 2010 and 2011 is due to abnormally wet growing seasons that resulted in land that couldn't be seeded because of excess moisture.

Land Cover Type on Saskatchewan Farmland, 1976-2011, Census of Agriculture 2011



Note: Due to abnormally wet growing seasons in 2010 and 2011 land that couldn't be seeded because of excess moisture were reported to the Census of Agriculture as "too wet to seed" and is categorized in this table as "other".

The organic matter of Saskatchewan's farmland soils is being restored through zero-till and other soil conservation methods. Various permanent cover programs have also contributed to some cropland being seeded back to grass. The area devoted to tame or seeded pasture has more than doubled from 1986 to 2011. Permanent cover holds topsoil in place and uses moisture efficiently. Pastures provide grazing and winter feed for livestock as well as habitat for a variety of wildlife.

What we are doing

Saskatchewan farm families have learned how to be adaptable and innovative. One area of conspicuous leadership in our province is the move towards zero and low-till agricultural practices. This practical adaptation has led to unexpected benefits in the area of climate change.

Back in the 1990s, Saskatchewan soils were considered to be a net emitter of carbon. Advances in zero and low-till agriculture have increased the amount of organic matter to store carbon. In 2014, Saskatchewan soils sequestered an estimated 11.43 million tonnes (megatonnes) of carbon.

There have been other benefits as well. Zero-till provides cover that reduces vulnerability to soil erosion as well as resilience to droughts and extreme weather. By reducing the number of passes over a field, fuel and labour are saved, which lowers production costs and reduces air pollution.

Saskatchewan is the biggest carbon sink in Canada. In 2014, the province's soils sequestered 11.43 million tonnes of carbon from the atmosphere.

Feature Stories for Land

Celebrating waterfowl restoration

In 1986, the North American Waterfowl Management Plan (NAWMP) partnership was founded with the goal to restore continental waterfowl populations to 1970s numbers. Conservation projects across priority landscapes in Canada and the United States were implemented; Mexico joined in 1994.

The Prairie Habitat Joint Venture (PHJV) partnership was formed to consolidate the efforts of many conservation agencies across Alberta, Saskatchewan and Manitoba. The goal of the PHJV supports "healthy prairie, parkland and boreal landscapes that support sustainable bird populations and provide ecological and economic benefits for society."

The PHJV covers one of the most productive areas for waterfowl in the world with wetland habitats ranging from small potholes and sloughs to larger lake, marsh, and bog systems containing about 1.5 million wetlands, and covering 1.7 million hectares. Through NAWMP, the PHJV connects Saskatchewan conservation agencies to funding sources in Canada and the United States and focuses effort on conservation projects that address shared goals.

11 million acres of habitat benefit from the Prairie Habitat Joint Venture.

Close to 70 per cent of the continent's waterfowl breed in, or migrate through, the province. The numerous wetlands and grasslands of the prairies and parklands, along with boreal wetlands further north, provide critical habitat for waterfowl, waterbirds and other wildlife. These lands generate a wide range of important environmental benefits for Saskatchewan people.

For the past 30 years, NAWMP partners have worked to safeguard these habitats and the benefits they provide. Programs have included extension projects and support for agricultural stewardship of working lands, securement and management of high value conservation areas and science and monitoring to inform and improve program delivery over time.

Since 1986, the NAWMP-PHJV partnership has brought over $600 million in conservation funding to Saskatchewan. Combined with provincial agency contributions, these funds have restored and secured 1.8 million hectares of Saskatchewan habitat, and supported private agricultural land stewardship on an additional two million hectares in the province. In total, approximately 11 million hectares of habitat benefit from PHJV programs, including permanent cover and soil conservation actions. Continentally, NAWMP has become one of the largest and most successful co-operative wildlife and habitat management efforts in history.

In recent years breeding waterfowl in Saskatchewan have responded well to wetter conditions. However, despite the substantial contributions of NAWMP programs, the long-term capability of landscapes in the PHJV to support waterfowl populations remains a concern due to ongoing habitat loss. Market pressures for increased conversion of wetlands, forage and pasture lands to annual crop production are an ongoing challenge for conservation. Saskatchewan's continued participation in the PHJV and NAWMP will help sustain conservation and seek responsible development solutions going forward.

Strategy protects high-value land

3.5 million acres of land were assessed as high, moderate or low ecological value under the new strategy.

Saskatchewan's picturesque and pristine natural grasslands are a defining feature of our province. Protecting the lands they rest upon is a shared responsibility between the environmental community, ranchers and the Saskatchewan government.

The Wildlife Habitat Protection Act (WHPA) protects designated agricultural Crown lands with significant ecological and habitat values. WHPA was introduced in the 1980s to allow agricultural use on predominantly uncultivated leased land, in recognition that animal grazing is a sound land management practice. In 2014, the province implemented the Southern Conservation Land Management Strategy to allow lessees to purchase WHPA land assessed as having moderate or lower ecological value.

After consultation with environmental stakeholders and agricultural producer groups, this new approach was developed to balance economic growth with responsible land management.

A science-based tool, considering things such as natural land cover, unique ecological features, presence of species at risk, and proximity to other conservation lands among other factors is used to assess the approximately 3.5 million acres of WHPA-designated land that was then classified into three categories.

The ultimate goal of the strategy is to balance a variety of ecological values. Agricultural producers are good stewards of the land and there is broad-based support to allow people the opportunity to purchase the land. Since the introduction of the new strategy, more than 80,000 acres of land have been removed from WHPA.

The Conservation Easements Act was amended to create a new Crown conservation easement which can be applied to Crown land prior to sale. While some land is now available for sale, greater environmental protection has now been built into WHPA and *The Conservation Easements Act*.

Also significant, habitat conservation and development was given a boost by earmarking seven per cent of all WHPA land sales to the Fish and Wildlife Development Fund. That move was applauded by the Saskatchewan Wildlife Federation, which called it a sound example of how government can work with its stakeholders when it comes to protecting our natural resources.

Another commitment was to examine vacant agricultural Crown land for possible inclusion in WHPA. This would protect high ecological value lands to prevent their sale. As of November 2016, more than 13,000 acres of high ecological value have been added through the regulations.

With the new Southern Conservation Land Management Strategy, the future of Saskatchewan grasslands is in good hands.

- **32,545 hectares** (80,421 acres) of low ecological value land have been removed from the Act as of November 2016, making them available for sale.
- **5,570 hectares** (13,762 acres) of high ecological value land have been added as of November 2016, preventing their sale.
- From May 2014 through December 2016, more than **$1.25 million** has been added to the Fish and Wildlife Development Fund through designation of seven per cent of the sale of lands formerly designated under WHPA.

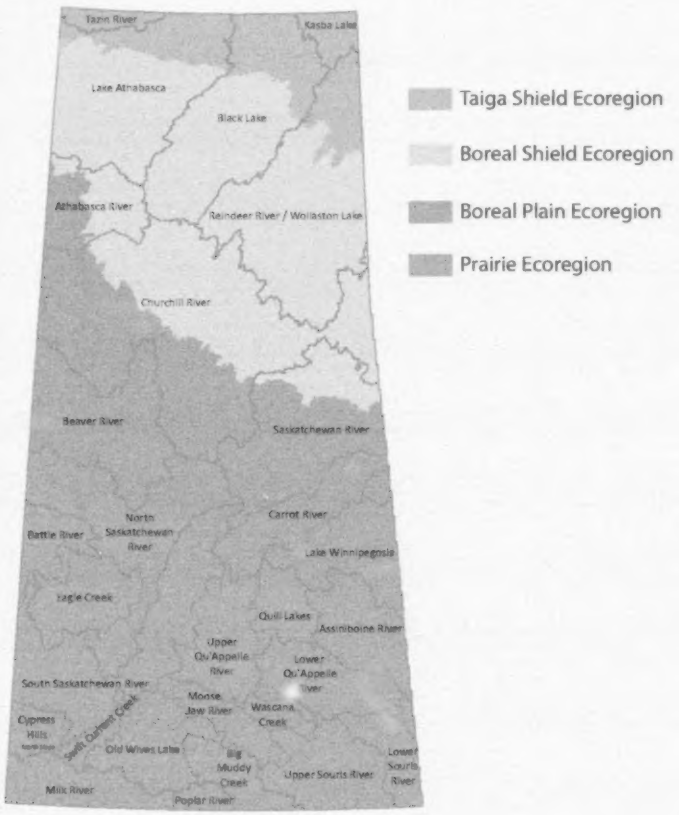
water

In Saskatchewan, the Water Security Agency (WSA) is responsible for managing the province's water supply, protecting water quality, ensuring safe drinking water and regulating the treatment of wastewater. WSA owns and manages 69 dams and their related water supply channels and works to reduce flood and drought damage, protect aquatic habitat, and provide information about water to the public.

A watershed or drainage basin is an area that drains to a specific point – typically a body of water such as a lake, or a location on a river. It includes all the land, water, plants and animals within its borders. Each watershed has a unique mixture of land and water resources. Landforms such as hills or other heights of land usually determine the boundaries of watersheds. Watersheds within Saskatchewan drain into one of three water bodies: the Arctic Ocean, Hudson Bay, or the Gulf of Mexico. Saskatchewan contains 29 primary watersheds. Water indicators are reported at the watershed level.

Water quantity and quality are affected by climate and the physical characteristics of the watershed, including slope, geology, soil type, vegetation, land use, wetland drainage and water use. Some of the key stressors on Saskatchewan's ground and surface water quality and quantity include water consumption, agricultural production, nutrient loading, aquatic fragmentation and stormwater runoff.

Saskatchewan Watersheds



Key Indicators

Water Quality

Safe and reliable water sources are critical for maintaining healthy ecosystems and human health. In Saskatchewan, the Water Security Agency monitors the surface water quality of rivers, lakes and streams. Find out which provincial waters are healthy, stressed or impacted. *(see page 40)*

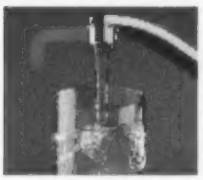
Water Quantity

Surface water quantity is the amount of surface water within a watershed. In Saskatchewan, surface water is used for many purposes including human consumption of treated water, ecosystem health, recreation, and economic activities including industrial use, power generation and agriculture. Find out where water quantity is high, normal or low. *(see page 44)*

Water Allocations

Surface water allocation is the volume of water that a project is allowed to withdraw from a surface waterbody. Learn more about the main users of surface water in Saskatchewan and what percentage of surface water they use. *(see page 47)*

Water Consumption and Conservation



Some of the stresses on our water include population growth, the change in demographics as people move from rural to urban areas, economic growth, climate change, pollution and irrigation. Find out how much water is used and conserved each year in the province. *(see page 49)*

Water Quality

Why it matters

Everyone needs safe drinking water. In 2010, through Resolution 64/292, the United Nations General Assembly made it clear that clean drinking water and sanitation are essential to the realization of all other human rights.

In Saskatchewan, our Water Security Agency monitors the quality of water in our rivers, lakes and streams. From this we can gain a better understanding of normal levels, long-term trends and the impact of human activities.

One tool used is the Canadian Water Quality Index. It provides a standardized way of comparing and reporting the health of surface water in our rivers, streams, and lakes.

The Index assesses the chemical, biological, and physical qualities of water. That assessment is compared to a set of objectives. Scientists look for the number of times the objectives aren't met, and for how long.

Data is collected from a number of monitoring stations throughout the province and is scored:

- Watersheds scoring between 80 and 100 are considered to be healthy. The watershed shows no apparent change and is resistant and resilient to change.
- Watersheds scoring between 45 and 79 are considered to be stressed.
- Watersheds scoring less than 45 are considered to be impacted. The watershed has a change and/or degradation in function and/or services.

What is happening

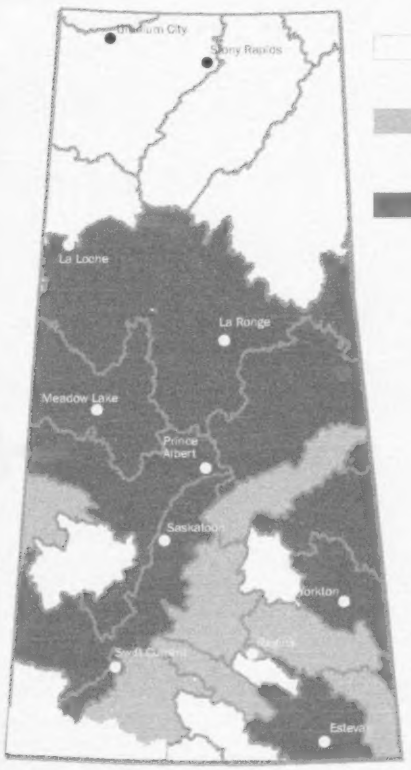
The average Water Quality Index values for 2006-2010 and 2011-2015 are calculated for the watersheds with sufficient monitoring to calculate index values. Sixteen of the 29 watersheds in the province had water quality sites that were sampled in both time frames being compared.

The five-year average Water Quality Index for 2006-2010 was rated as healthy for nine watersheds (56 per cent), and stressed for seven watersheds (44 per cent). The five-year average Water Quality Index for 2011-2015 was rated as healthy for eight watersheds (50 per cent), and stressed for eight watersheds (50 per cent).

The Battle River had average Water Quality Index values close to a healthy rating in both timeframes, with five-year average values of 79.5 for 2006-2010 and 78 for 2011-2015.

The Water Quality Index did not change for 15 out of 16 watersheds between 2006 and 2015. Swift Current Creek was the only watershed with a different rating category between the two time periods. It changed from healthy in 2006-2010 to stressed in 2011-2015. The five-year average Water Quality Index value for the Swift Current Creek for 2006-2010 was 83 and 78 for 2011-2015. No specific trends in the water quality samples from the watershed indicate why the watershed moved from healthy to stressed.

Average Water Quality Index, 2006-2010

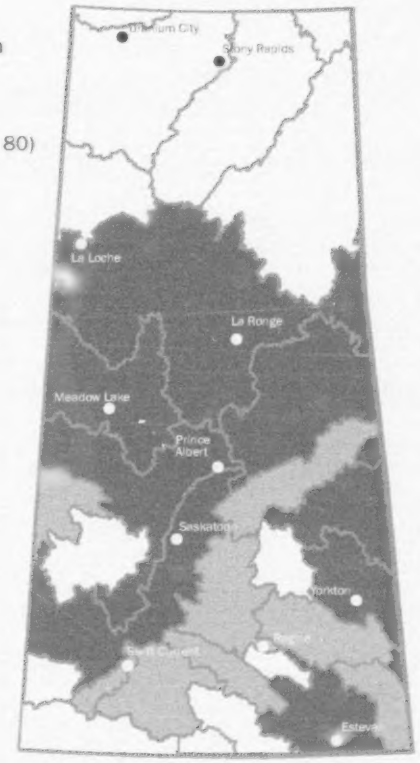


Insufficient data

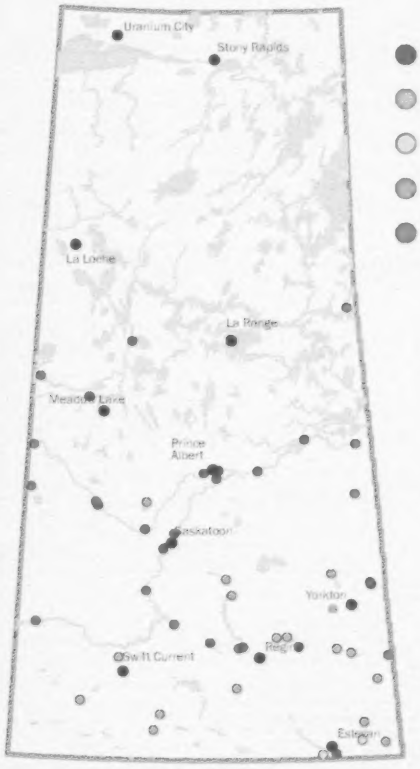
Stressed
(45 to less than 80)

Healthy
(80 - 100)

Average Water Quality Index, 2011-2015



Water Quality Index Monitoring Sites



- Water Security Agency - Primaries
- Water Security Agency - Lakes
- Water Security Agency - Reservoirs
- Water Security Agency - Lower Order Streams
- Environment and Climate Change Canada

What we are doing

Provincial and federal government programs are monitoring surface water quality for the protection of both the aquatic environment and water for human uses.

Water Security Agency - Surface Water Quality Monitoring Programs

The Surface Water Quality Monitoring Program monitors water quality in select watercourses and waterbodies. These programs cover 13 of Saskatchewan's 29 watersheds. The water quality parameters measured include nutrients, major ions, bacteriological tests, general water quality [pH, dissolved oxygen (DO), temperature], organic carbon, chlorophyll a (lakes), suspended solids, trace metals and, at primary stations, select pesticides.

- **24 primary monitoring stations** along Saskatchewan waterways, including the Assiniboine, Battle, Beaver, Qu'Appelle, Churchill, Clearwater, North Saskatchewan, Saskatchewan, South Saskatchewan, and Souris rivers.

  The Primary Station Monitoring Program is a continuation of a group of water quality monitoring stations established in the 1970s. The original goal was to monitor variables in water quality in major transboundary waters (Alberta, Manitoba, and North Dakota). These stations also support work conducted by the Prairie Provinces Water Board. Some sites were located to gain a better understanding of contributions from major point source discharges or to assess changes from reservoir impoundments. Ongoing monitoring is important for understanding the state and change in water quality which assists with management. Sampling and analysis of benthic macroinvertebrates began in the autumn of 2013. Data from the monitoring stations are also provided to Environment and Climate Change Canada's Canadian Environmental Sustainability Indicators program.

- **Five lakes along the Qu'Appelle River** (including Pasqua, Echo, Katepwa, Crooked and Round)

  Long-term monitoring of the downstream Qu'Appelle lakes is conducted in compliance with water management agreements with First Nations. Monitoring also supports watershed plan implementation and the province's water quality priorities of protection, enhancement and management of water resources. Monitoring goals include collecting data to assess and improve understanding of trends and, in conjunction with other projects, to assess nutrient loading on the Qu'Appelle River. This work also supports the development of site-specific water quality objectives.

- **Two reservoirs** (Alameda and Rafferty)

  Water quality monitoring of Rafferty and Alameda reservoirs is part of the province's regulatory requirements. Monitoring includes sites on the reservoirs and spring monitoring upstream on the Souris River, Roughbark Creek and Moose Mountain Creek.

- **Lake Diefenbaker**

  Lake Diefenbaker is of high economic, social and recreational value to the province. Water from the reservoir flows down the Qu'Appelle channel to Buffalo Pound Reservoir, which is the water supply for Regina, Moose Jaw and surrounding areas. The main outflow from Diefenbaker is the water supply for downstream communities, including Saskatoon. The Water Security Agency initiated a water quality monitoring program in Lake Diefenbaker in the autumn of 2009. WSA also supports and participates in research examining various aspects of water quality in Lake Diefenbaker. Published works and ongoing research is complementary to WSA's long-term monitoring program by providing detailed assessments to better understand the current state and assess longer-term changes in water quality.

- **14 lower order streams** (Avonlea Creek, Lanigan Creek, Lightning Creek, McDonald Creek, Moose Jaw River, Moose Mountain Creek, Oscar Creek, Saline Creek, upstream portion of the Souris River, Spirit Creek, Swift Current Creek, Willowbrook Creek, and Wood River)

This program examines water quality in streams that arise within Saskatchewan and are located in regions where agricultural group plans have been established. WSA conducts and reports on water at 14 sites chosen because they are lower order streams than the rivers monitored through the Primary Monitoring Program or by the Prairie Provinces Water Board (PPWB). The objective of the study is to conduct long-term water quality monitoring to determine how land use, land use changes and water quality are interconnected. Benthic macroinvertebrates are also being monitored at a number of the 14 lower order stream sampling water quality monitoring sites. Because of their smaller size, these streams are more closely linked to land use influences than larger rivers.

Saskatchewan's Surface Water Quality Monitoring Program includes 24 monitoring stations, five lakes along the Qu'Appelle River, two reservoirs, Lake Diefenbaker, and 14 streams.

Special Water Quality Programs

- The Quill Lakes are large saline lakes located north of Last Mountain Lake in central Saskatchewan. There used to be two Quill Lakes. Over the years, water levels have risen and formed one big lake, flooding thousands of acres of farmland and threatening infrastructure. The situation in the Quill Lakes is one of the most complex water management issues in Canada.

- The Nutrient Mass Balance study was completed on the Qu'Appelle River. This study was initiated by WSA in 2013 to identify and quantify sources of nutrient loading to the Qu'Appelle River, from the Qu'Appelle dam to the outflow of Round Lake. Such studies are designed to improve understanding of risks to water quality and provide insight into how management activities can improve water quality. To date, study results have not been published.

- To ensure that water resources are shared fairly, the Prairie Provinces Water Board was formed in 1948. PPWB water quality monitoring ensures that water quality at interprovincial boundaries is maintained at acceptable levels. Water quality is monitored along 12 major eastward-flowing rivers that cross inter-provincial boundaries between the three Canadian prairie provinces.

Watershed Stewardship

As of 2016, source water protection plans have been developed for eleven watersheds and the Yorkton area aquifer. There are eleven non-profit community-based watershed groups formed to focus on source water protection.

Assiniboine Watershed Stewardship Association
Carrot River Valley Watershed Association
Lower Souris River Watershed Stewards
Moose Jaw River Watershed Stewards
North Saskatchewan River Basin Council
South Saskatchewan River Watershed Stewards
Swift Current Creek Watershed Stewards
Wascana Upper Qu'Appelle Watersheds Taking Responsibility
Lower Qu'Appelle River Watershed Stewards
Old Wives Watershed Association
Upper Souris Watershed Association

Water Quantity

Why it matters

The quantity of water in our rivers and lakes depends on a number of different factors. These include the speed of snowmelt in the spring, plus rain and soil conditions. Other factors such as groundwater discharge and storm runoff also play a role. The biggest factor determining water quantity is how much we take out of the system.

Surface water is measured by depth or as flow. The monitoring is done by Saskatchewan's Water Security Agency and Environment and Climate Change Canada.

Water is in continuous movement above, on, and below the surface of the earth. This hydrologic cycle tracks water molecules as they transfer from the oceans and into the atmosphere by evaporation. Then, that water is deposited on the land as precipitation. Finally, water is transferred back to the ocean and lakes by rivers and groundwater.

Surface water quantity, land management and surface water quality are strongly interconnected.

Water shortages can harm water quality. Shortages can be caused by changing weather patterns and when other jurisdictions change their practices.

Stream flows must go up and down to promote biodiversity and a healthy ecosystem. Changes in natural flow patterns affect these ecosystems and may alter the aquatic habitat.

> In Saskatchewan, surface water is used for many purposes including human consumption, ecosystem health, recreation, and economic activities including industrial use, power generation and agriculture.

What is happening

In 2015, higher-than-normal water quantity was observed in southeast and central Saskatchewan compared to other parts of Saskatchewan. Changes in temperature and precipitation (rainfall and snowfall) cause water quantity in rivers to fluctuate throughout the year. Where water quantity is classified as low for a hydrometric station it is likely that drought conditions exist. Hydrometric stations with high flows typically indicate a wet period for the region near that hydrometric station or at a watershed level.

Hydrometric Stations in Saskatchewan, 2015

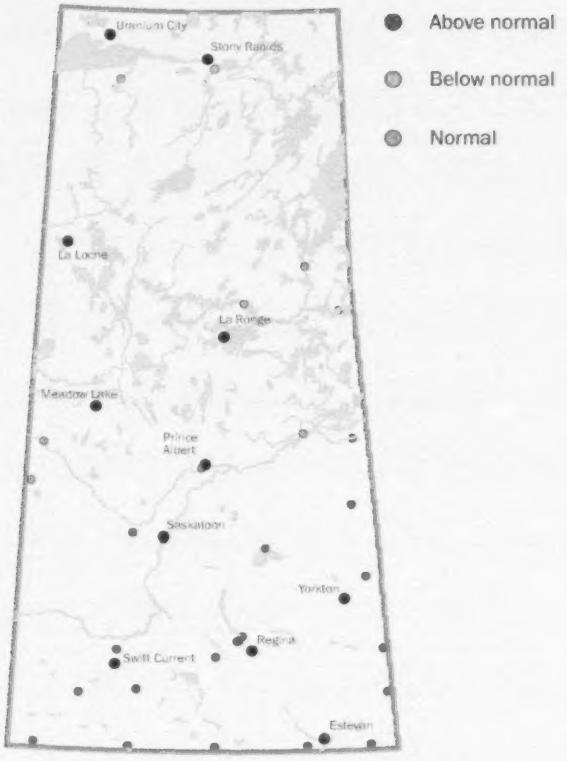
Three Saskatchewan watersheds do not have hydrometric stations: Athabasca River, Big Muddy Creek and Kasba Lake watersheds. Although we don't have hydrometric stations within the Saskatchewan side of the Athabasca River and Kasba Lake watersheds, there are hydrometric stations that monitor these watersheds in Alberta and the Northwest Territories. There is no station in the Big Muddy Creek Watershed as the waterways in this watershed are short-lived in nature.

In 2006-2010, the average water quantity value was rated as normal for 26 (79 per cent) of the hydrometric stations and higher-than-normal for seven (21 per cent) of the hydrometric stations. In 2011-2015, the average water quantity value was rated as low for two (6 per cent) of the hydrometric stations, normal for 10 (30 per cent) of the hydrometric stations and higher-than-normal for 21 (64 per cent) of the hydrometric stations.

The water quantity classification for a hydrometric station is based on a comparison of the five-year average condition at that station to its 30-year average (1986-2015). A hydrometric station's rating for a year is the category that is most frequently observed at that station within a given year. A hydrometric station classified as low does not mean that the water quantity was consistently low throughout the year, but that low water quantity conditions were most frequently observed within that year.

Water Quantity, 2006-2010

Water Quantity, 2011-2015



What we are doing

To help ensure surface water use is sustainable, the Water Security Agency regulates the use of water and the construction, extension, alteration and operation of water diversion works (e.g., dikes, dams, weirs, reservoirs, etc.). This is managed through the issuance of Water Rights Licences and Approvals to Construct and Operate Works as found in *The Water Security Agency Act.*

The Water Security Agency is leading implementation of a number of actions from the 25 Year Saskatchewan Water Security Plan to:

- evaluate existing water supplies and future demands for the next 25 years and beyond to determine the need for new infrastructure across the province;
- analyze the water supply situation in the major rivers; and
- identify the flow required to sustainably support the aquatic ecosystem.

In Saskatchewan, surface water quantity is monitored cooperatively by the federal and provincial governments through the national hydrometric program. Hydrometric monitoring occurs in 26 of Saskatchewan's 29 watersheds. The activities of this program include the collection, interpretation, and dissemination of surface water quantity data and information to decision-makers and the public.

Using hydrometric data, the Water Security Agency's River Forecast Centre prepares monthly provincial streamflow forecasts for Saskatchewan. These forecasts describe the current stream flow and water levels in the province and provide forecasts of expected flow conditions and lake levels. Data from 158 hydrometric stations are used for this initiative, including the 126 stations the Water Security Agency monitors as part of the Water Survey of Canada and the additional 32 stations the Water Security Agency monitors that are not part of the Water Survey of Canada.

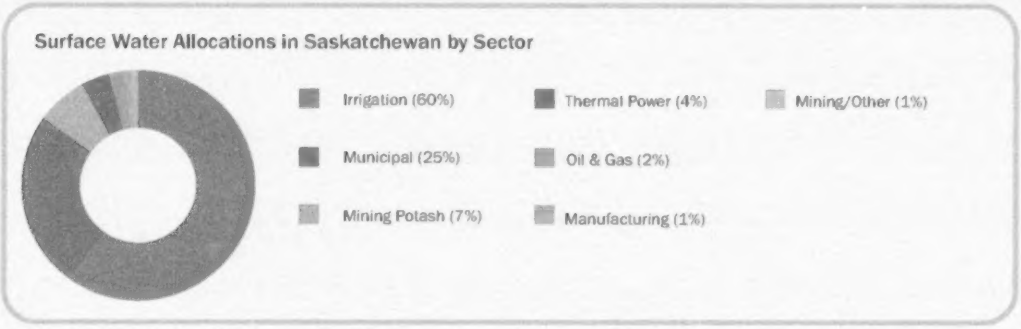
Water Allocations

Why it matters

An important factor to consider when assessing the health of Saskatchewan's water is allocation. This is the percentage of total natural flow that is earmarked for specific human activities.

In Saskatchewan, the main uses for surface water are irrigation and water provided to homes by municipalities. These two sectors consume more than 80 per cent of the surface water used in Saskatchewan.

About 27 per cent of municipal and communal waterworks in Saskatchewan use surface water to serve about 57 per cent of the province's residents, or approximately 651,000 people.



What is happening

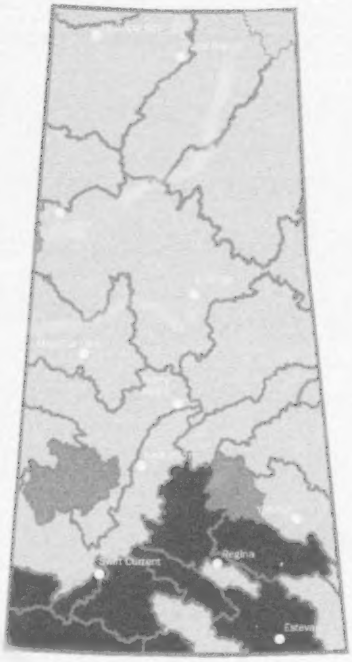
Twenty of the watersheds in Saskatchewan currently have a surface water allocation ratio of less than 35 per cent. The remaining nine watersheds all have surface water allocation ratios greater than 40 per cent, which has the potential for placing high stress on these watersheds. These values do not represent the actual water used or consumed, but rather the amount of water that is allocated for use. The majority of licensed allocations do not consume the full amount they have been allocated. The surface water allocation rating takes into consideration the Prairie Provinces Water Board's 1969 Master Agreement on Apportionment. Under this agreement, if a watershed is part of an international or inter-provincial basin, the Province of Saskatchewan must provide 50 per cent of the estimated median annual flow to the receiving jurisdiction.

Surface water allocation ratings fall into three categories:

- Low intensity: Surface water allocation and losses are less than 20 per cent of the natural flow.
- Moderate intensity: Surface water allocation and losses are between 20 per cent and 40 per cent of the natural flow.
- High intensity: Surface water allocation and losses are greater than 40 per cent of the natural flow.

The surface water allocation ratio was obtained by dividing the annual diversion (surface water allocations and evaporative losses) by the natural flow volume. The annual natural flow volume is the estimated median flow in the absence of any human modification, such as dams, reservoirs, irrigation, or allocation.

Surface Water Allocation Ratio



From 2011 to 2015, under wet conditions, there was no shortage of water for allocations. Saskatchewan has typically been able to over-deliver on allocations associated with interprovincial and international apportionment agreements. It is important over the long term for the province to remain conscious of allocations and water use across Saskatchewan to respond to drier conditions.

What are we doing

Surface water allocation in Saskatchewan is regulated by the Water Security Agency, through *The Water Security Agency Act*. The Water Security Agency has the responsibility for administering the approval process for the construction and operation of water supply diversion works, and the right to use surface water.

An Approval to Construct is required for any works where water is to be diverted or impounded from or within its natural channel or bed. Works that require approval include irrigation projects, intensive livestock, multiuser, municipal or industrial water supply systems, dams and reservoirs for livestock, domestic, recreational and wildlife, or other water diversion schemes. Any use which will consume greater than five million litres of surface water will require approval from the Water Security Agency.

The Water Security Agency recognizes the importance of flows for the ecological (physical, chemical and biological) health of stream courses. Currently, dams are informally and proactively operated to maintain minimum flows for some specific aspects of ecological health. In addition to maintaining minimum flows, variation and timing of flows can also be ecologically important. WSA is currently researching methods of determining and achieving sustainable flows that can best meet watershed health objectives, while maintaining domestic, municipal, industrial, and irrigation water needs.

The Water Security Agency is leading implementation of a number of actions from the 25 Year Saskatchewan Water Security Plan relating to water allocation systems to:

- Evaluate existing water supplies and future demands for the next 25 years and beyond to determine the need for new infrastructure across the province.
- Investigate alternative measures to increase the delivery of water from Lake Diefenbaker to Buffalo Pound Lake, including evaluation of the feasibility of the Qu'Appelle South Irrigation Project.
- Develop a modern system of water allocation, including a new allocation policy and regulations.
- Review existing water rights licences and assess current water use.
- Determine the existing use of water, level of protection of environmental flows, how much water is available for future allocation, and identify areas where water scarcity may be a factor.

Water Consumption and Conservation

Why it matters

There is increasing pressure on Saskatchewan's water resources. Our population is growing. People are moving from rural to urban areas. Economic growth and climate change are also adding to the strain.

A process to coordinate surface water withdrawals is a key management tool for the ministry. This process ensures that current and future withdrawals are sustainable. In Saskatchewan, approval is required if a surface water withdrawal amounts to more than 13,700 litres per day. That's equal to five million litres per year.

Conserving our water makes economic sense. If water conservation can keep demand within the capacity of existing systems, expensive investments in new reservoirs and pipelines can be reduced or avoided. Pumping and treating water also consumes energy. Reducing the use of treated water cuts energy consumption and greenhouse gas emissions.

- **60 to 65 per cent of the water used in your family's home is used in the bathroom**. Each year, about $220 is flushed down the drain, and about $260 is used in the bath and shower.
- **70 per cent of the earth's surface is covered with water**, but only one per cent is useable fresh water.
- According to Environment and Climate Change Canada, the average Canadian uses **329 litres of water per day**. Compare that to the average person living in a third world country, who only uses eight litres of water per day.
- **1,000 litres of tap water costs about $2**. The same amount of bottled water costs about $1,500.

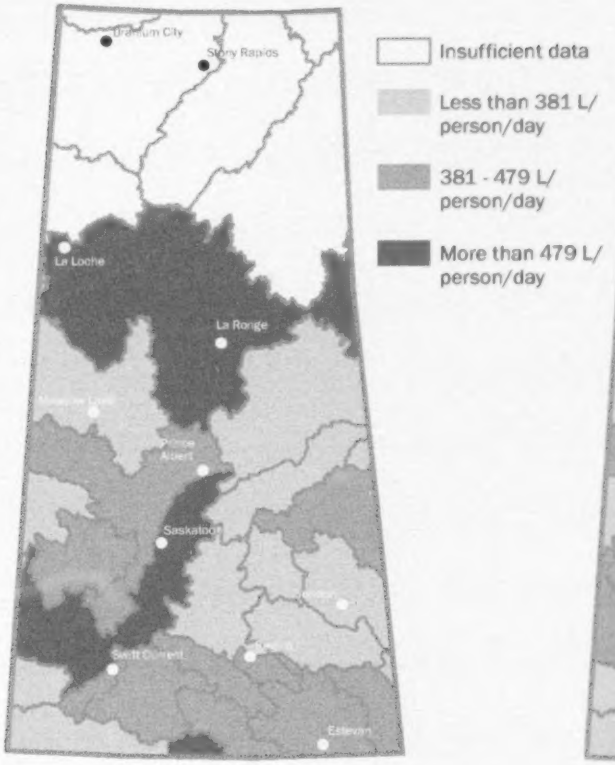
What is happening

To compare five-year average water use, 23 of the 29 watersheds in the province had communities that reported their water consumption every year between 2006 and 2015. The average annual municipal water use per capita for both five-year averages was less than 381 litres per person per day (L/person/day) for nine watersheds, between 381 and 479 L/person/day for six watersheds, and greater than 479 L/person/day for one watershed.

Caution is required when comparing municipal water use per capita between watersheds because:

- communities have differing proportions of residential use to industrial, commercial and public service demands;
- several large municipalities are located outside of the watershed from which they source water (e.g., Regina, Moose Jaw); and
- many communities rely on groundwater that may not be confined to the watershed boundaries.

Municipal Water Consumption, 2006 - 2010



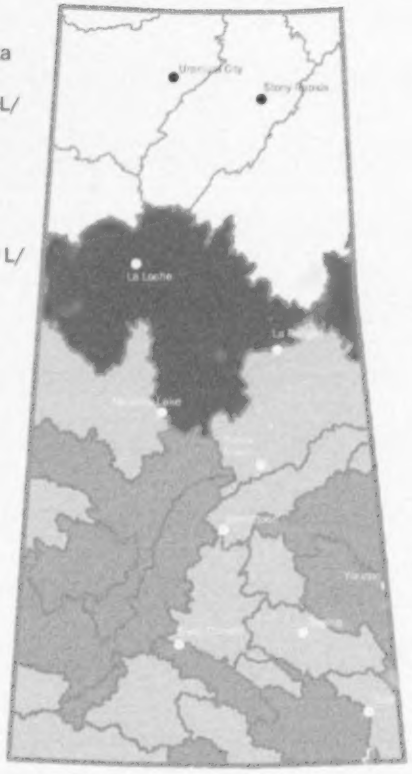
Insufficient data

Less than 381 L/ person/day

381 - 479 L/ person/day

More than 479 L/ person/day

Municipal Water Consumption, 2011 - 2015

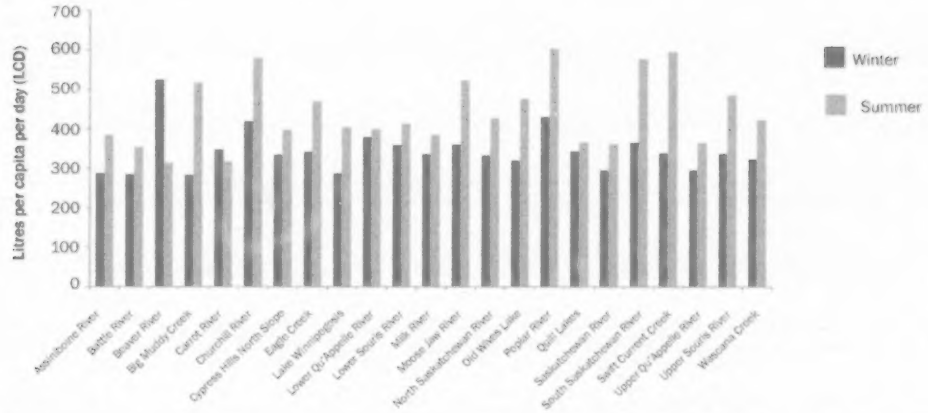


Across all watersheds, there was on average a 10 per cent decline in per capita water consumption between 2006 and 2010 and between 2011 and 2015. Eight watersheds moved from a higher water consumption rating in 2006-2010 to a lower water consumption rating in 2011-2015. The only watershed that increased its water consumption in 2011-2015 compared to 2006-2010 was the Assiniboine River Watershed.

Watersheds with a rating of high intensity in both the Surface Water Allocation indicator and high municipal water consumption value in the Water Use and Conservation indicator help to identify areas that will benefit from targeted water conservation programming.

10-Year Average Water Consumption, 2006 - 2015

10-year Average Municipal Per Capita Water Use, 2006 - 2015



On average, water used in summer is 19 per cent higher than over winter. The Beaver River Watershed was the only watershed that used on average 67 per cent more water in the winter than in the summer. The reason for this variation is because many communities need to keep their systems pumping water continuously in the winter to keep the pipes from freezing.

What we are doing

Public education helps promote water conservation. People can do more good if they are aware of the direct role they play. They also need to know about conservation measures available to them. In 2010, the Water Security Agency partnered with the US Environmental Protection Agency to promote the WaterSense label in our province. This label identifies products that perform well, while using less water.

Feature Stories about Water

Prevention key to keeping invasive species out of Saskatchewan waters

Clean, Drain, Dry! You may have seen posters, highway signs and online ads telling you to clean, drain and dry your boat. Aquatic invasive species such as zebra and quagga mussels must be kept out of Saskatchewan. Once they enter a waterway, they are nearly impossible to remove.

Zebra and quagga mussels have no natural predators in Saskatchewan and can do massive damage to aquatic ecosystems, recreation areas and equipment. Mussel larvae are invisible to the naked eye, and can be brought in with contaminated water on your boat. Adult zebra mussels are so hardy, they can live for 30 days out of water.

Preventing their entry into the province is the single most effective action we can take. Conservation officers and Canada Border Services agents conduct boat inspections to prevent invasive mussels from entering the province. At the same time, monitoring staff and volunteers check our lakes and rivers to make sure that we don't have any established here. No invasive mussels were found in any of the waterbodies sampled in 2016 by the government's monitoring program.

In 2016, the Government of Saskatchewan conducted 776 watercraft inspections and 25 decontaminations. Saskatchewan works closely with other jurisdictions on this issue and will continue to work with other agencies and jurisdictions to coordinate efforts.

The people of the province are asked to do their part to keep our water free of invasive mussels, plants and other species. Clean and inspect boat, trailer and all related gear. Everyone should drain boat before leaving the boat launch. Dry boat and gear between trips.

Wastewater finds new life

Saskatchewan's Water Security Agency regulates more than 600 permitted sewage works, and some of those facilities release regulated treated effluent into surface water such as rivers and streams. Other wastewater facilities rely on evaporation to manage their treated effluent. SaskWater is piloting a project that returns treated effluent safely back to the environment through irrigated woodlots.

Specially-selected tree species are able to use approximately three to five times the volume of wastewater compared to traditionally irrigated crops such as alfalfa or hay. The goal of the project is to make use of a high volume of waste water while protecting surface and groundwater quality. Recycling wastewater can reduce water demand, productively recycle nutrients and contribute to soil health. One of the additional benefits of wastewater can be for the creation of new habitat and recreation areas.

Safe wastewater can be used to create new habitat and recreation areas.

Quill Lakes among Canada's most complex water management issues

Saskatchewan's Quill Lakes are large saline lakes located north of Last Mountain Lake in central Saskatchewan. There once were three lakes. Over the years, water levels have risen and formed one large lake, flooding thousands of acres of farmland and threatening infrastructure. The situation in the Quill Lakes is one of the most complex water management issues in Canada.

The lakes are internally drained, meaning the furthest downstream lake, Big Quill Lake, does not have outflow under normal precipitation and evaporation conditions. In fact, the lake has not had outflow in recorded history. Water entering the Quill Lakes is principally lost through evaporation and water levels fluctuate based on precipitation patterns. Water levels in the Quill Lakes have experienced a rapid increase over the past dozen years.

Water levels in Big Quill Lake have increased by around 6.8 metres (more than 22 feet) since a low point in 2004. The Quill Lakes are saline due to long-term accumulation of salts from runoff entering the lake and water then being lost to evaporation. Salinity in the lakes varies depending on water level, especially in Big Quill Lake. Salinity has varied from over 70 g/L when water levels are low, to less than 10 g/L when water levels are high. To put that in perspective, the salinity of the ocean is around 35 g/L.

In 2007, the Water Security Agency (WSA) monitored water quality on the Quill Lakes at several locations. More recently, WSA conducted localized monitoring of Big Quill Lake in 2012 and 2013. Increased monitoring of the Quill Lakes in 2014, 2015 and 2016 was conducted to assess water quality variation in the main bodies of Big, Middle and Little Quill Lakes.

WSA monitors three stations on each of Big and Little Quill Lakes, and one station on Middle Lake (also known as Mud Lake), twice per summer. WSA also monitors other waterbodies and watercourses in relation to the Quill Lakes to support understanding of various management options.